Public Policy Developments in the Industry—*Decision in the Rate Case of the Edison Electric Illuminating Company of Brooklyn*—*Effect of the Election on Tendencies in Legislation together with the regular departments*

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Electrical World

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Electrical World

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Publicity with Ideals

AMERICA'S Electrical Week, now being celebrated, from a narrow viewpoint is simply a concentrated merchandising effort. All over the country central stations, dealers and contractors are engaged locally in special drives to sell more electrical appliances. While this stimulus to local effort is important because it helps to teach the industry merchandising values, the wider significance of the movement ought not to be overlooked. Last year, Electrical Prosperity Week came at a time when business was just beginning to improve and as a result the Week helped materially to increase local sales. This year the industry has been faced with the problem of filling orders rather than getting more business, and so from the narrow view the impetus to sales will probably be less pronounced than last year. America's Electrical Week, however, is more than a sales drive. No industry is more blessed with associations and societies than the electrical business. But, in our opinion, in all our efforts in these societies and associations, we talk too much about ourselves and too little about the relation of our work with the great marketplace of activity outside our own profession or branch of the industry. As engineers we talk to other engineers, as public utility men we discuss problems with other public utility men, as merchants and manufacturers we exchange experiences with others of our own chosen circle. Of our professional or business relations with the great world outside we say little or nothing and they know too little or nothing.

The Society for Electrical Development has the opportunity to interpret the electrical industry in the world's marketplace—the public outside the industry. America's Electrical Week in this broader aspect is part of such a movement. The poster exhibit conducted by the society as the beginning of this year's propaganda, the electrical issues published by several popular periodicals and fostered by the society, the lighting of the Statue of Liberty, which the society has helped to promote, each are part of a worthwhile movement, intangible and hard to measure concretely, but certainly of advantage to the industry and far outweighing, on any measurable basis, the money put into the effort. Publicity is an art by itself. Its cheapest form is puffery. Given ideals, it is a powerful educational force to acquaint the average man with the significance of a movement in which thinking men agree. The ELECTRICAL WORLD believes in publicity with such ideals. It believes that the industry as a whole needs more such publicity, interpreting to the sister arts and industries and to the public the advantages of electricity.

America's Electrical Week this year, as last, will result in local sales. but its lesson in educational publicity is of greater significance.

Labor in Regulation

INJECTION of the labor question into the issue of regulation is forecast on an imposing scale by developments at Washington. If wages and hours of labor become an accepted factor in the national regulation of railroads it is likely that in time they will also be factors in the state and local regulation of public utilities generally. State and local regulative measures usually follow the lines of national legislation and policies on this subject. Electrical utilities have therefore a deep interest in the outcome of the contest which is looming large in current events.

The scene toward which the country is looking at Washington had a smaller counterpart during the recent electric railway strike in New York City. Leaders of the striking trainmen tried to enlist the aid of regulative authorities in a settlement of the strike. As the Public Service Commission did not assume that the law gave them authority to take definite action to settle a strike their action was purely advisory in character and represented simply their readiness to lend a hand in the settlement of a problem. This action was ineffectual and, although the strike has never been declared "off," the companies are operating substantially complete service. As the result of this experience it is anticipated that the New York Legislature will be asked on behalf of the commission to insert a specific clause in the regulative law giving the two commissions in the State full authority to act if labor troubles threaten impairment of public utility service. The fact that employees went to the commission in this case makes it appear that they would welcome a change in the law. Such an attitude is the reverse of the position which they took when the first draft of the New York law was prepared. At that time, 1907, a general clause was included under which it was believed the commissions could act upon matters affecting employees and thus touching upon the regularity and safety of operation; this clause was removed at the request of the employees.

Electrical utilities have an unquestioned concern in whatever steps are taken to change the fundamental bases of regulation. Their interest and the public interest lie first in the maintenance of service. Under

most conditions the relations between employer and employee are subordinate to the question of continuous operation. But when a great principle is involved the utilities cannot be expected to be supine in surrender. They will not easily abandon the management of operation to a public body which is not responsible for the protection of the earning power or the investment. If regulation is to acquire rights under the law in the settlement of labor questions it can do so with equity only by assuming at the same time a responsibility in rate-making. If it is to raise expenses it should in fairness learn whether rates are high enough to bear the heavier burden which it is imposing. And if it finds that only higher rates will justify higher expenses it will have a duty to perform in so stating to the public, regardless of political considerations.

Wireless to Japan

FROM a number of viewpoints the development of trans-oceanic radio-telegraphy has been less rapid on our Pacific coast than in the East of the United States. The first signals over the great bodies of water passed from Wales to Newfoundland, and the first trans-ocean messages to leave the United States traveled from Massachusetts to Scotland. Moreover, the first commercial service competing with submarine cables was that between Nova Scotia and Ireland, and the New Jersey-Wales circuit was ready for use before the equivalent distances were regularly spanned on the West coast. The two pairs of intercommunicating stations in Germany and near New York have been in almost constant use since the European war began, and in spite of the handicap of comparatively small power have transmitted a notable number of messages.

On the Pacific Coast, wireless to Honolulu from San Francisco was attempted commercially as early as 1911. The first twenty-four-hour service was inaugurated late in 1912 or early in 1913. In September, 1914, a second channel of radio signaling was opened to the public, and the Hawaiian Islands were thus linked with the American continent by three separate communication systems. The distance is slightly over 2000 miles, and the traffic comparatively light; it has been stated that neither the cable nor the wireless would be self-supporting unless it handled through messages for points beyond Honolulu.

A few weeks ago the commercial radio service between Kahuku, Hawaii, and Funabashi, near Tokyo, Japan, was inaugurated. This connects directly with the Kahuku-San Francisco stations and gives transmission by wireless between the United States and Japan with a single relay. The total distance is well over 6000 miles, the new link being more than 4000 miles long. Under favorable conditions the Hawaiian relay plant may be passed over, and direct communication established between the two extremes. The new connection has begun its fight for a share of the Pacific cable business by cutting the rate per word to about two-thirds.

Not the least interesting feature of the new extension is its possible use for wireless signaling between Japan and Europe. The ability of several of the local high-powered stations to span the United States has been repeatedly demonstrated. It thus becomes possible, without adding to the present system, to interconnect the antipodes *via* wireless.

Protection Against Surges

ONE of the difficulties confronting the designer of an electrical transmission and distribution system is to make it surge-proof. The system may be capable of operating normally for an indefinite period, and yet it may possess inherent weak points, which may be broken down by some unexpected surge, precipitated in the system by an accidental disturbance, not severe in itself. A river in heavy flood may be safely flowing within the channel of its banks and levees, until the wave thrown up by a passing motor boat causes a wash over that may lead to a perforation of the bank.

The report of the Schweizer Elektrotechnische Verein on the subject of electric surges which has recently been published is abstracted in this week's "Digest." The abstract contains fifty-six items, all of a practical character. The report urges such construction and operative control as will tend to avoid setting up surges. It also indicates what to do, in order to prevent the surges finding their way into the stations and swamping the apparatus. As protection against lightning, one or more galvanized steel overhead ground wires are very properly recommended. As a matter of terminology, it seems unfortunate that the committee should seek to designate the "surge resistance" of a line by the term "characteristic." This new term "characteristic" is hardly shorter than "surge resistance" and is much more likely to be misunderstood. A line inherently possesses a number of characteristics, from an electrical point of view; but it can have only one surge resistance. If one speaks of the characteristic of a line, it is by no means clear without the context what kind of characteristic is meant. The report as a whole, however, will surely be of interest to operating engineers whether they agree with all of the recommendations or not.

Cleanliness and Illumination

THE rapidly increasing use of semi-indirect and indirect lighting fixtures brings to the front as never before the necessity for proper attention to keeping the reflecting surfaces clean. With direct lighting, especially from open shades, dirt is a comparatively small factor in the net result since it usually does not lodge to any considerable extent on the inside of a shade and that which lodges on the outside is comparatively inoffensive and easily dusted off. Not so when the upturned bowl, opaque or translucent, is utilized to distribute the light. Dust settles on the active surface often in rather large quantities and greatly decreases the reflection to the ceiling. In case of semi-indirect fixtures it also cuts down the transmitted light to no

inconsiderable degree. Tests which have been reported from time to time in our columns show that it is perfectly easy with either class of fixture to get a loss of 25 to 30 per cent due solely to the accumulation of dust. One cannot impress too strongly on the user the importance of keeping these modern and very desirable types of fixtures thoroughly clean.

A Prophecy Fulfilled

AS far back as the summer of 1907, when the American Institute of Electrical Engineers met at Niagara Falls, in commenting on the Burton Bill and its effect on electrical developments at Niagara Falls, the ELECTRICAL WORLD concluded as follows: "The net results, therefore, and the probable effect of the Burton Bill if continued, is a restriction within the State of New York of the use of Niagara power to substantially the amount of the present demand and the forcing of the three great plants now partially constructed on the Canadian side to seek a market in Canada for about two-thirds the output of their completed plant instead of transmitting the larger part of that power to the State of New York and possibly beyond as originally intended. There is every indication pointing to the belief that even without change in tariff schedules, the Canadian market eventually will be sufficient to absorb all the power originally intended for American consumption."

The prediction then made has come to pass and the government sits supinely by while American industries suffer for want of electrical energy. No fault can be found with Canada for claiming what is her own or for offering every inducement to American concerns to settle on the Canadian side of the Niagara frontier. Censure rests on the American government and particularly on the Secretary of War, who has at his disposal under the treaty 4400 cu. ft. of water per second, the power from which is sorely needed by the electrochemical industries at Niagara and also by the city of Buffalo, but who permits it to run to waste. Meanwhile, a private corporation in Buffalo is erecting a huge generating station to help relieve the situation and to hold American industries within the United States. This selfish yet public-spirited action of the power company stands out in strong contrast with that of the government. We have in the action of the latter a typical example of bureaucratic inefficiency and inaction.

Temperature Effects in Lamp Filaments

THE introduction within the last few years of the type C tungsten incandescent lamp, with its helical filament, has introduced some new and noteworthy conditions into photometry. In fact, the photometry of incandescent lamps has had to be considerably modified in consequence of these new lamps. An interesting property of the type C lamp is that the inside portions of the glowing helix look very distinctly brighter than the outside. This subject is discussed in an interesting way by B. E. Shackelford, in a recent article in the *Physical Review*, which is abstracted in last week's Digest.

Two explanations have been offered for the observed difference in brightness between the inside and outside of the helix. The first is that the inside is distinctly hotter, and therefore has a higher specific radiation. The second is that the filament is to some extent a mirror, as well as a radiation source; so that in addition to emitting light the inner sides of the helix reflect it, and hence appear brighter than the outer sides which can only emit light. Mr. Shackelford adduces experimental evidence in favor of the reflection hypothesis. The inside walls of the helix will necessarily be hotter than the outside walls, but the difference appears to be relatively small—only a few degrees Centigrade—and quite insufficient to account for the difference in brightness. On the other hand, a specially polished ribbon filament markedly augmented the difference in brightness, thus supporting the reflection hypothesis.

Not only is the brightness of the interior wall of the helix increased by reflection, but the color of the wall is also changed by reflection. It is an axiom in the theory of radiation that even if a metal, when incandescent, is selective in its emission, being unduly bright in certain regions of the spectrum; yet if the glowing metal were fashioned into a hollow cavity or oven, the radiation emerging from a small hole in this glowing oven would be pure and non-selective, owing to the effect of internal reflections. Such a glow oven would behave like a black body, or pure non-selective radiator. The tungsten filament helix forms an imperfect oven with ribs for walls, and the light coming from the interior is therefore more nearly normal, or blackbodyish, than that coming from the outside surfaces. We may expect this influence to lower slightly the efficiency of any incandescent lamp like the gas-filled tungsten filament lamp in question, which possesses a helical filament.

The Coming Issues

NEXT week, in the station operating number of the ELECTRICAL WORLD for December, a leading article will present an account of the interesting change-over from three-wire single and three-phase, to four-wire three-phase, recently completed by the Denver Gas & Electric Light Company. A novel scheme for indicating the presence of grounds by both visible and audible signals will be described in the same issue, dated Dec. 9. In the engineering number for Dec. 16, the installation of outdoor high-tension equipment will be featured, concluding the discussion on high-tension construction the first installment of which appeared in the ELECTRICAL WORLD of Nov. 18. The fourth issue of the ELECTRICAL WORLD for December is the commercial issue of the month, in which problems in the sale of energy by central stations are dealt with. Attention of readers interested in detail merchandising methods is also called to the December number of ELECTRICAL MERCHANDISING, the new magazine, issued on the 15th of each month, which extends the editorial service of the ELECTRICAL WORLD to the trade.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

INSULL SPEAKS ON ECONOMY OF ELECTRICAL SUPPLY

Predicts Time Will Come When Commissions Will Investigate Methods of Distribution as Well as Methods of Financing

Speaking before the Illinois Electric Railway Association at Chicago on Nov. 28, Samuel Insull, president of the Commonwealth Edison Company, said electrical people had spent energy, time and money in perfecting economical appartaus, but had neglected to some extent to study the conditions of production and supply through which great economies could yet be effected. At one time, said Mr. Insull, less energy per capita was sold in Chicago than in any other large community. But since a study has been made of methods for taking advantage of different demands and the diversity factors of all classes of business, and since steps have been taken for the massing of production, the Commonwealth Edison Company now supplies more energy per capita than any other company in the world operating on steam power. But even with this record the company supplies only about one-third of the possible energy consumption in Chicago. Down-State companies, according to the best information available, are supplying only about one-fifth or one-fourth of the possible energy production.

The most neglected point in economic power supply is the study of conditions governing the use of electricity. Too few are taking advantage of everything to prevent duplication of investment. Too little attention has been given by most people to the seasonal diversity that exists, and there has been not enough marshalling into one vast system of distribution with the idea of preventing duplicate investment to reduce the average over-all cost per kilowatt-hour of supply, it was emphatically stated by Mr. Insull.

Engineers of the Insull companies are now engaged in working out a map of the transmission lines of the State and securing as far as possible the maximum demands of the different systems and the times at which these maximums occur in order to determine the diversity between the various systems. It is not the idea that energy produced in the Illinois coal fields can be used on the northern border of the State, but if all electrical properties of the State were feeding into one vast series of transmission networks the electrical people would have contributed more to the conservation of the resources of the State than even politicians promise. There would be a mammoth saving in investment and in operating expense, and if the inter-connections were extended to include steam railroad supply, it would be possible to effect an economy that cannot even be hoped for through increasing the efficiency of generating and distribution apparatus.

Taking such steps means greater economy of capital, means low cost, and means low selling price. The regulatory bodies at present are most interested in low selling price. Mr. Insull said he believed the time would come when commissions would be interested in a company's method of distribution to the same extent that they are now interested in methods of financing public utility properties.

LABOR AND WAGE SITUATION FROM VARIOUS ANGLES

Leaders of Labor Unions, Commissioners and National Industrial Bodies Discuss the Issues Involved and Offer Solutions

Within the past two weeks much has been made of the labor and wage question throughout the country. The issue which has arisen chiefly over the Adamson law passed by the last Congress and granting an eight-hour day with ten-hour pay to certain steam railroad employees, has been broadened somewhat so as to include all public utilities, and the discussions now have to do with the broader questions of the public regulation of wages, hours and working conditions. Back of it all is the desire to eliminate strikes and the consequent injury and injustice these work on the general public.

Organized labor is opposed to any injunction against strikes. In fact, the American Federation of Labor has adopted a resolution to the effect "that any injunction dealing with the relationship of employer and employee and based on the dictum that labor is property be disregarded, let the consequences be what they may."

Objections to Compulsory Arbitration

The objections which the labor unions have to compulsory arbitration were summarized by W. S. Carter, president of the Brotherhood of Locomotive Firemen and Enginemen, at a meeting of the Academy of Political Science in New York, as follows:

1. It is but a scheme by which the employer hopes to gain a mastery over his employees: (a) By making strikes illegal, and thus deprive working people of their only economic power. (b) By suppressing labor organization, through depriving them of the power to effect their purpose. (c) By creating conditions of labor through judicial process, which process the master class always has and always will greatly influence.

2. It is but the expression of a selfish desire of those who complain: (a) To avoid the personal inconvenience incidental to all strikes, without regard to the injustice against which the workers are struggling. (b) To avoid the financial loss to business interests engaged in production and transportation, regardless of the financial loss that may fall upon the workers.

3. It is but a symptom of the mental and moral degeneration, through which all great and prosperous nations have passed, when: (a) Fundamental principles of individual liberty are forgotten. (b) That for which the founders of liberty were honored becomes a social menace. (c) The struggle for wealth overshadows all else, with consequent disregard for the rights of the working classes.

4. It is a deliberate effort to deprive working people of their economic power: (a) Through guise of legislation to preserve public peace. (b) Through an artificial public opinion, largely created by those who control the public press. (c) Through a presumption that for public convenience the federal judiciary will find a method of depriving all working people of their constitutional rights against involuntary servitude except as punishment for crime.

Right of Public in Labor Disputes

Judge Cohen, who helped to formulate the protocol that brought an unusually long period of peace to the unsettled garment-making trade of New York, before the same body proposed a definite league made up of the consumer, the neutral public, the worker and the employer founded upon the following propositions:

1. The clear recognition of the moral and legal right of men to organize.
2. The establishment of tribunals sanctioned by law, whose membership shall be representative of all three parties (employees, employers and public).
3. The creation of fact-gathering machinery to enable such tribunals to determine what is in any given case a "fair and reasonable wage" and what are "fair and reasonable working conditions."
4. The clear recognition of the necessity for efficiency and discipline in all industrial organizations.
5. Opportunity to every worker to secure just redress from arbitrary or oppressive exercise of the employer's functions.
6. Opportunity to every employer to secure just redress from arbitrary or oppressive exercise of power by the men.
7. The right to appear by his chosen organization or spokesman before all sanctioned tribunals and in all dealings between employers and employees.
8. The registration of all collective agreements.
9. A national council, without whose sanction there shall be no concerted cessation of work or closing-down of plants, to which any interested party may apply for relief, as it may in public service matters to the Interstate Commerce Commission or the public service commissions, or, in trade matters, to the Federal Trade Commission.
10. Such national council to be constituted of members elected from groups of employers and groups of workers and representatives of the public.
11. In public utilities, clear recognition of the function of the state, as part of the regulation of the service and the rates, to determine what is a reasonable wage and what are reasonable working conditions.
12. Clear acceptance of the proposition that, adequate machinery being established for the redress of all just grievances, the right to coerce by concerted stoppage of work in all service affecting the public health, safety or convenience shall be made as obsolete as the duel or as illegal as lynching. (This principle to be applied if and when such machinery is established.)

In closing Judge Cohen said: "The basis of the great industrial compromise is here. The trade unionist must yield in his opposition to governmental regulation of his organization; the employer must yield in his opposition to the organization of trade unions; the public must yield in its indifference to the conditions under which human work is done; the business man must yield in his opposition to 'social uplift' in industry, and the social reformer must yield in his indifference to efficiency and discipline in modern production. Upon such a compromise can be founded a program of preparedness for peace."

RATES SUBORDINATE TO WAGES

Chairman Oscar Straus of the New York Public Service Commission, First District, in addressing the Academy of Political Science on Nov. 23, said in part:

Public service corporations are monopolies and endowed with the rights as well as with the duty to serve the public. Their powers are limited by law and regulation to perform their services not arbitrarily but under public control. In other words, such corporations are dedicated to public interests. In order that these public service monopolies may be compelled and empowered to serve the public, the employees must also be made to recognize their duty to the public and should not be permitted to appropriate the public necessities to paralyze the operations of such public utilities. But in return there should be accorded to and guaranteed to such employees exceptional wages and conditions of service. It has been suggested there should be in each state and in the nation a wage commission with power not only to regulate rates but also wages, and as the human element, wages and conditions of employment should be paramount. Rates should be subordinate to wages and not wages, as now, subordinate to rates.

This can be done in public utilities because in their nature they are noncompetitive and monopolistic within the area they operate, while other industries are competitive and are now under the anti-trust laws prevented from becoming noncompetitive.

MUNICIPAL LEAGUE FAVORS WAGE REGULATION

The National Municipal League, an organization founded by representatives of civic bodies throughout the country, received at its twenty-second annual meeting in Springfield, Mass., on Nov. 24, a committee report treating broadly on the subject of public regulation of wages, hours and working conditions of utility employees. In general the franchise committee felt the outstanding fact to be that "continuity" is a fundamental interest of all three parties concerned: for the employees, continuity of employment; for the companies, continuity of earnings, and for the public, continuity of service.

The committee believed that the public interest is sufficient to warrant the adoption of legal measures to prevent strikes, but that until effective substitute measures for the adjustment of the grievances of employees have been worked out and tested, it would be unfair and impracticable to deprive the employees absolutely of the right to use their ultimate weapon of self-defense. The committee favored the use of laws and ordinances to establish standard conditions of employment where franchise conditions do not exist or are not applicable, and particularly to establish modes of procedure for the settlement of disputes and the limitation of the right to strike. It did not, however, look agreeably upon any appeal to legislative bodies to settle disputes directly, without full investigation, by the passage of laws fixing wages, hours or conditions of employment in a given public utility or class of public utilities.

Turning to the method involving public service commissions, however, the committee stated that wherever well-equipped commissions exist, the duty of establishing detailed standards and rules relative to the relations of utilities and their employees might properly be imposed upon such bodies. Moreover, as to the settlement of particular disputes and the fixing of wages, etc., in particular cases, the committee favored that experimentally the power be given to the commissions rather than to special tribunals, the decisions to be final for comparatively short periods.

VALUATION OF PUBLIC SERVICE ELECTRIC COMPANY

Commission's Expert Makes Supplementary Report Showing a Complete Valuation of $44,386,000—Hearings to Be Resumed on December 13

The New Jersey Board of Public Utility Commissioners held a hearing on Nov. 23, in connection with the investigation of rates now charged by the Public Service Electric Company, to consider a supplementary report submitted by Prof. Dugald C. Jackson, Boston, engaged as valuation expert by the board. This report estimates the cost of reproducing the underground lines and certain other properties of the company at $9,624,606, which, with the first report submitted in January, 1916, showing a valuation of $35,008,200 of the company's overhead system, power plants, substations and other buildings, effects a total of about $44,386,000, allowing for revisions as explained by Dr. Jackson at the hearing. This amount, it was stated, is held as the physical valuation of the company's property from an engineering viewpoint, exclusive of any so-called intangible property, estimated for the different divisions of the company's service as follows: (second report) Essex division, $4,403,500; Hudson division, $1,385,300; Central division, $671,900; Passaic division, $741,700; Southern division, $614,700; Bergen division, $163,800; not separable by divisions, $833,800; 3 per cent allowance for contractors' profit in construction, $273,100; allowance for individual company construction, $290,000. Hearings on the valuation will be resumed by the commission on Dec. 13.

America's Electrical Week Now in Progress

President Wilson to Give Signal for Permanently Flood-Lighting Statue of Liberty on Saturday Night, the First of the Campaign's Activities

FOR the second time in the history of electricity the nation is devoting a week to the celebration of the progress of the art. America's Electrical Week begins to-day, Dec. 2. The prosperity idea which was first introduced to the industry last year by the Society for Electrical Development has taken root. From every viewpoint the America's Electrical Week campaign is far ahead of last year's Electric Prosperity Week. More cities and individuals are interested in the week this year than last. A far greater number of electrical shows are being staged this year than last. Manufacturers, central stations and the trade are now alive to the possibilities opened up by such a national celebration, with the result that the enthusiasm of the industry this year knows no bounds. Last year the week had as its purpose the starting of the prosperity ball a-rolling. This year the prosperity of the industry is so evident that the keynote of the celebration will be "education of the consumer."

STATUE OF LIBERTY FLOODLIGHTED

The first great activity of this year's nation-wide celebration will be the flood-lighting of the Statue of Liberty in New York harbor. This statue, presented to the people of the United States by the people of France thirty years ago, will now be wholly visible at night, lighted in the best manner known to illuminating engineers.

Elaborate ceremonies have been arranged to dedicate the lighting of the Statue of Liberty. President Wilson will arrive in New York City to-day to accept the new system of illumination on behalf of the nation. The President will give the signal for the lighting of the statue, and after the exercises the federal yachts will return with their passengers to the Battery. An automobile procession through specially lighted streets will take the party to the Waldorf-Astoria Hotel, where a dinner and public reception has been planned. Mayor Mitchel has appointed a committee of 200 citizens to assist him in welcoming the President. On this committee are many men prominent in the electrical industry.

The sources of the flood-lighting are fifteen batteries of projectors. Eleven of these batteries are located upon the eleven salients of the old fort known as Fort Wood, upon which the base of the statue was built. Three batteries will be located upon the roofs of small buildings on the island. The other battery will be located upon the balconies of Liberty's arm, just below the torch.

The total number of projectors is 246, each rated at 250 watts and 35 volts, each of the 246 projectors having its individual compensator. The projectors and compensators are mounted on specially designed pipe-framed circuits, individually designed for the different locations.

The Public Service Corporation of New Jersey will supply 2200-volt, two-phase energy through submarine cables from its plants situated across the bay.

Finally, to put "life" or a quiver into the simulated flame of the burning torch, about fifteen 500-cp. gas-filled incandescent lamps will be placed upon a series of flashers.

The activities planned for a number of cities and which have not as yet reported in the ELECTRICAL WORLD follow:

In Seattle, Wash., the celebration will be featured by the electrical show, which is to be free to the public. The Seattle exhibit will be held on the second floor of the O'Shea Building. Not only are the leading electrical firms of the city having elaborate displays, but there is a special section devoted to the exhibits by public school pupils, showing their work in applied electricity, for which prizes have been offered. A feature of the electrical show will be the suggestions offered for Christmas shoppers, the motto of the electrical stores this year being, "Make it an Electrical Christmas."

Harrisburg's celebration will be under the management of the local Jovian League. A show at which more than twenty local exhibitors will participate will open on Monday night.

Eau Claire, Wis., has arranged for a spectacle parade to take place during one of the evenings of the week.

Every inch of space has been sold in the State arsenal for the electrical week at Springfield, Ill., Dec. 4-9. All of the bigger mercantile houses of the city have united with the electrical men to make the week the biggest event in the business of the city. A style show will be given on one of the evenings with living models furnished by the larger stores. Dancing will be held each evening.

The three Atlantic City papers have run double-page electrical ads in three issues preceding the week. With each iron sold the Atlantic City Electric Company offers an ironing board free. Dealers and contractors are co-operating in extensive window displays and lighting.

An electric show will be held in the ballroom of the William Penn Hotel, Pittsburgh, on Dec. 5 and 6. Admission will be by ticket, the committee aiming to provide a display not only of electric novelties, but to provide music and entertainment for its guests.

Space in Toledo's great Terminal Auditorium has been overbid and it is not possible to provide accommodations for all who want to exhibit. The A. E. W. activities in Toledo will be conducted in conjunction with the Land Show running from Dec. 4 to 16.

Massillon, Ohio, will have an electric show with at least twenty exhibitors, most of which will be out-of-town concerns. The show will be held in a vacant store and will be the first ever staged in Massillon. A house completely wired for electricity will be one of the principal exhibits.

Atlanta will have its second electrical show, which

from the present outlook will be half again as large as last year. Twenty per cent of the receipts will go to an Atlanta charity, the choice being determined by popular vote. Among the hundreds of exhibitors, representing every electrical industry in Georgia, is a display by the electrical students of Georgia Tech.

The Schenectady committee will run page advertisements in both local newspapers, the space being paid for by merchants interested directly or indirectly in advancing electricity. Extensive poster board display, window decoration and general illumination, besides educational propaganda, are phases of the program.

The Edison Electric Illuminating Company of Brooklyn, N. Y., has announced a 10 per cent reduction during the week from the regular prices of its easy payment house wiring plan. An electric show will be held in the Brooklyn Edison shop, the display occupying the entire ground floor; actual demonstrations of all the devices will be made. The show will aim to be an advance Christmas display. Thirty-five thousand individual invitations have been sent to residential consumers, space in theater programs, periodicals and all local newspapers have been arranged.

Instead of a central show such as was held last year, each business house in Sandusky, Ohio, will make special displays and special discounts from their places of business. This means that twenty-nine little electric shows will be scattered throughout Sandusky. These twenty-nine business interests have subscribed to a general fund for advertising purposes. The widest use of the society's window cards, car cards, poster boards and other helps will be made by these interests.

Pittsfield, Mass., is putting on an electric show. The Jovians in charge have adopted as a slogan, "See Aladdin," and in order to make good they will have a diminutive Aladdin call forth the Modern Genie and demonstrate his superiority over the Genie of fiction. Every possible domestic application of electricity will be shown in some form or other, all exhibits being in operation as far as possible. The show will be conducted in the afternoons and evenings—in the afternoons there will be a series of lectures of general interest followed by moving pictures of electric features—the evenings will be devoted to demonstrating electrical appliances until 10 o'clock, after which there will be dancing.

The Davenport, Iowa, electric show will be equipped with a high power wireless apparatus and efforts will be made to "talk" with other electric shows throughout the United States.

The Kansas City, Mo., committee has arranged to have a speaker each day at the luncheons of the various clubs, such as Co-operative Club, Rotary Club and the Commercial Club, taking up the full week. These clubs will be addressed upon the subject of "Electrical Development" and there will be demonstrations in the room during the luncheons—this will bring the work directly before the most active and prominent men in the city.

America's Electrical Week at Hot Springs, Ark., will open with a carnival backed by the Business Men's League. Special electrical displays have been provided for in the downtown district and every effort will be made to make this a gala week. Railroads have agreed to co-operate in the matter of advertising and by offering reduced rates and increased train service; special concerts will be given daily at places of business at which there are special displays and sales days.

The local committee at Superior, Wis., has secured an empty store building in the heart of the retail shopping district which will be fitted up as a Home Electrical. An essay competition is being conducted. The building in which the electric show is to be housed will be outlined with electric lights and at the two points on the main street representing the limits of the retail district, extensive decorative lighting will be installed. A large sign advertising America's Electrical Week will be placed on the roof of the leading department store and flood lighted. All companies handling electrical appliances have arranged for special window displays.

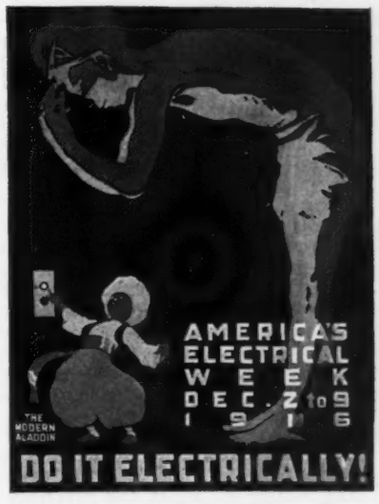
More than $20,000 was raised by the electrical interests of Detroit to carry out an elaborate program which hinges about an electric show. All space for this show has been sold and there is already an advance sale of $11,000, the admission prices being 50 cents. The free list is suspended except to newspaper men, employees of the show and social workers. Each night during the week will be given over to a special feature. The search for the Goddess Electra has created the widest interest among Michigan's attractive young women who seek the honor of being crowned the queen of the carnival. More than 150 women are competing for this honor.

In addition to electrical shows this year's celebration includes such activities as pageants, essays by school children on electrical topics, street decorative lighting, electric vehicle parades, etc.

Electrical shows are being held in forty-two cities, according to reports received by the Society for Electrical Development. Below is given a list of cities having shows.

ELECTRIC SHOWS PLANNED FOR AMERICA'S ELECTRICAL WEEK

Aberdeen, Wash.	Jersey City, N. J.	Pittsfield, Mass.
Atlanta, Ga.	Louisville, Ky.	Plainfield, N. J.
Birmingham, Ala.	Massillon, Ohio.	Pueblo, Col.
Camden, N. J.	Milwaukee, Wis.	Rock Island, Ill.
Charlotte, N. C.	Moline, Ill.	San Francisco, Cal.
Cincinnati, Ohio.	Newark, N. J.	Sandusky, Ohio.
Davenport, Iowa.	New Brunswick, N. J.	Springfield, Ill.
Des Moines, Iowa.	North Hudson, N. J.	Springfield, Mo.
Detroit, Mich.	Oklahoma City, Okla.	Syracuse, N. Y.
Duluth, Minn.	Orange, N. J.	Toledo, Ohio.
Eau Claire, Wis.	Passaic, N. J.	Trenton, N. J.
Elizabeth, N. J.	Paterson, N. J.	Tulsa, Okla.
Fort Wayne, Ind.	Peoria, Ill.	Wichita, Kan.
Houston, Tex.	Pittsburgh, Pa.	



ALADDIN—OFFICIAL POSTER OF THE WEEK

One of the biggest features of our present campaign has been the co-operative work with the most influential national popular magazines and business journals having an aggregate circulation of more than 10,000,000. These electrical numbers are out this week.

The shipping force of the society was enlarged from two to fifteen men, and up to Monday night, Nov. 27, there had been shipped out the following co-operative material. Many late orders have been received which will completely exhaust the big supply of material.

Poster stamps	3,000,000	Bill posters	4,000
Window cards	30,000	Felt pennants	8,000
Car cards	22,000	Folders for public	1,300,000
Window lithographs	25,000	Movie slides	1,150
Muslin signs	12,000	Electros	2,956

GOVERNMENT ASKED TO ACT IN NIAGARA POWER CRISIS

American Electrochemical Society Brings Canadian Power Embargo to Attention of Secretary of War and Urges Relief

At its meeting in New York, Nov. 24, the board of directors of the American Electrochemical Society took up the matter of the Niagara Falls power crisis on the recommendation of the society's committee on public relations, and directed the president to send the following communication to the Secretary of War:

To the Secretary of War,
Washington, D. C.

Sir:—The Committee on Public Relations consisting of the President and Past Presidents of the American Electrochemical Society reports to the Board of Directors that owing to the large demand for power in Canada a considerable block of power now imported to this country will be cut off. The shortage of power in the United States caused by this Canadian demand will have a serious effect on our electrochemical industries.

Protests to the Canadian Government by the electrochemical industries of the United States are met by the reply that the Canadian Government must consider the interests of its own people first. It is therefore apparent that in order to assist our electrochemical industries in this emergency our government must be appealed to. The Committee on Public Relations, therefore, recommends that the Board of Directors of the American Electrochemical Society should communicate with you urging you to permit the temporary diversion of the 4400 cu. ft. of Niagara River water allowed by our treaty with Canada, until such time as Congress can take action in the matter.

After careful consideration the Board finds that in view of the serious crisis threatening the electrochemical industries of Niagara Falls, N. Y., it can strongly indorse the solution of the problem proposed by the Committee on Public Relations.

In indorsing the recommendation of the Committee the Board does not desire to offer any advice as to the ultimate disposal of the 4400 cu. ft. of water allowed to the United States by its treaty with Canada; but simply to emphasize the fact that the threatened power shortage is a serious menace to the welfare of our country since this is so largely dependent on the products of electrochemistry.

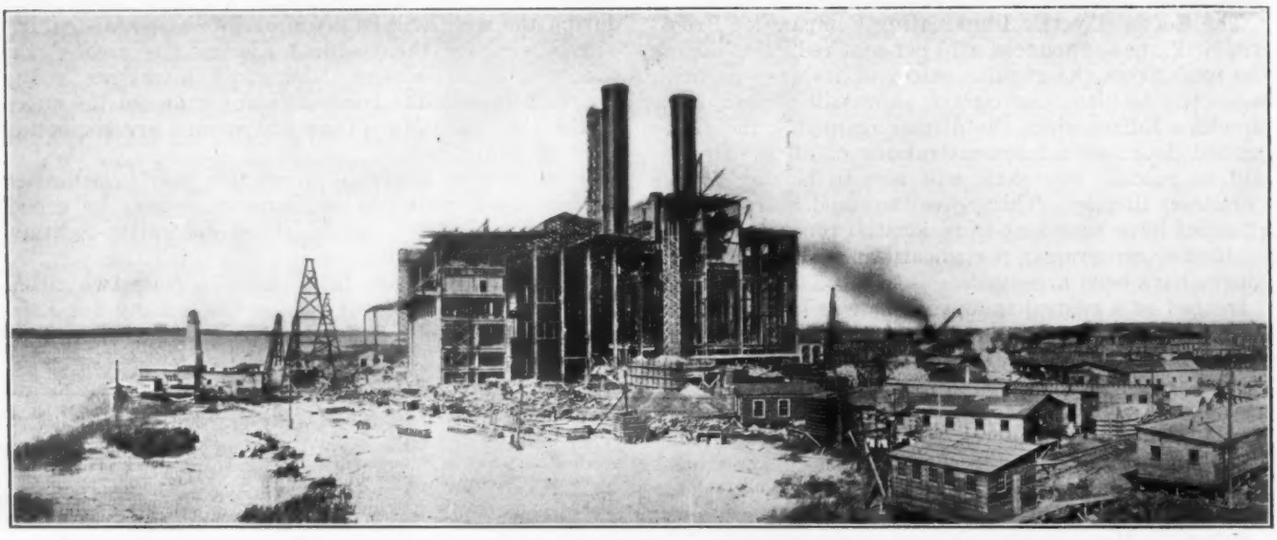
As an example showing how the power shortage will affect an important industry the Board respectfully calls your attention to the inclosed letter. The facts set forth are the more interesting in that the products of this factory are an absolute necessity to many other electrochemical industries. Thus, these are not only affected directly by the power shortage, but are indirectly embarrassed through their inability to obtain a sufficient supply of material necessary for their manufacture.

This is but a single example out of many which could be given, and the Board therefore begs to offer you its services in supplying any further information you desire as to the need of our electrochemical industries. Yours respectfully,

Francis A. J. FitzGerald,
President.

The letter referred to was written by Acheson Smith of the Acheson Graphite Company, and reviewed the power situation on the Niagara frontier and its effect on American electrochemical industries. The substance of the letter was given in last week's issue of Electrical World. The Acheson company is now building near Buffalo a new plant at a cost of approximately $750,000, to take power from the steam-generating station of the Buffalo General Electric Company. This new plant will give it a very large capacity, and the company hopes with its aid to be able to take care of its business very comfortably. However, it will naturally depend upon its Niagara Falls plant for a considerable amount of output, and if the power situation here does not improve it can only operate its Niagara Falls plant at 30 per cent of its capacity.

The Acheson company is, however, not the only one of the electrochemical companies at Niagara Falls, N. Y., which are suffering for want of electrical energy; all the industries there located in addition to other varied industries located between Niagara Falls and Buffalo are severely handicapped in their operations for want of power. It is expected that the new steam station of the Buffalo General Electric Company will offer some relief, but the demands are such that many feel that the relief will only be temporary.



STATION OF BUFFALO GENERAL ELECTRIC COMPANY

A. I. E. E. NEXT MEETING TO BE HELD IN BOSTON

Institute Will Take Part in Exercises Attending the Presentation of John Fritz Medal to Elihu Thomson

The 327th meeting of the American Institute of Electrical Engineers will be held in Boston on Dec. 8. The meeting will be under the auspices of the Boston Section and the protective devices committee. There will be a meeting of the standards committee at 9 a. m., finance committee at 10.30 a. m., board of directors at 11 a.m. From 9 a. m. until 1 p. m. inspection trips to the following places of engineering interest have been arranged: Condit Electrical Manufacturing Company,

maker of protective devices; Edison Electric Illuminating Company of Boston, South Boston power station; Boston Elevated Railroad Company's South Boston power station, and Gray & Davis, Inc., makers of electrical automobile accessories, Cambridge, Mass.

The technical session will be held at 3 p. m. in the Central Lecture Hall of the new buildings of the Massachusetts Institute of Technology. The following papers will be presented: "Rupturing Capacity of Oil Circuit Breakers," by Stephen Q. Hayes; "Method of Rating the Rupturing Capacity of Oil Circuit Breakers," by E. M. Hewlett.

At 6.30 p. m. an informal dinner will be held at the Riverbank Court directly opposite the new buildings of the Massachusetts Institute of Technology.

At 8.30 in the evening a meeting will be held under the auspices of the John Fritz medal board of award, at which the John Fritz medal will be presented to Dr. Elihu Thomson, as previously announced.

ONTARIO TO EXPROPRIATE NIAGARA POWER STATIONS

Hydroelectric Power Commission Hopes Also to Sell Energy at $7.50 a Horsepower-Year When Chippawa Project Is Completed

At a meeting of the Ontario Hydro-Electric Radial Railway Association held at Toronto on Nov. 21, (about 320 representatives being present, including the Mayors and prominent civic officials of the cities, towns and municipalities in the Hydro district of western Ontario) the following resolution was unanimously passed:

> It is hereby unanimously resolved that the Ontario government be asked to pass an order in council forthwith permitting the Ontario Hydro-Electric Power Commission of Ontario to exert its functions and power in expropriating the plant or product of the Canadian Niagara Power Company and others developing power at Niagara Falls.

Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, in addressing the gathering, stated that when the Chippawa development project is completed energy will cost $7.50 per horsepower-year. The present price will be reduced to $9.50 when the first 100,000 of the final 200,000 hp. is developed, and a further reduction of $2 will be made when the work is finally completed. He also stated that in order to facilitate the manufacture of munitions at present, the commission expected to develop an additional 20,000 hp. this year, but he was not at liberty to announce the new source of supply. He also announced that the construction of the Chippawa development work would be done under the direct supervision of the commission, instead of by contract.

NIAGARA POWER AGITATION DISCUSSED

In reference to the objections recently made by concerns at Niagara Falls, N. Y., against the request made by the commission to the Dominion government to restrict the export of a block of power by the Canadian Niagara Power Company in order that the commission might be able to supply the demand in Ontario, Sir Adam Beck stated that the center of the agitation was in Buffalo and was made for the purpose of compelling the United States War Department to hand over an additional 4000 cu. ft. per second of water from the Niagara River.

He said there was nothing in the statements that industries in Buffalo are being deprived of power, or threatened with loss of power, on the ground that it is all being sold to Canadian industries, because the 50,000 hp. which the commission requires for Canadian use was never exported and the machinery for the development of this power was only recently installed.

Referring to the Chippawa project, Sir Adam Beck stated that this development will eventually mean that American concerns will have to locate in Ontario, and that electricity at $7.50 per horsepower-year would mean that valuable fertilizer could be made as cheaply in Canada as in Norway.

It was stated during the meeting that 110 municipalities will vote on power development by-laws and twenty-eight on radial by-laws at the municipal elections in January next.

GOVERNMENT OWNERSHIP OF UTILITIES OPPOSED

Merchants' Association of New York Presents Resolutions to Newlands Commission Condemning the Principle and Giving Its Reasons Therefor

The Merchants' Association of New York, on the recommendation of its committee on transportation, has adopted the following preambles and resolutions: (1) Opposing government ownership and operation of public utilities; (2) advocating the exclusive regulation of all railroads by the federal government, and its representatives appeared before the Newlands commission last week in support thereof.

The resolution opposing government ownership and operation of public utilities is as follows:

Whereas, The Newlands commission, created by Senate joint resolution No. 60, is about to investigate, among other things, "the comparative worth and efficiency of governmental regulation and control [of public utilities] as compared with governmental ownership and operation," and

Whereas, The fundamental principles of our form of government require: That the members of legislative bodies and all principal executive officials be periodically subject to change; that the number of members of legislative bodies be large and that representation be sectional; that legislative bodies, by means of laws passed by them, direct and control in minute detail the acts of executive officials; that the discretionary power of such officials be restricted to the narrowest possible limits; that no outlays of public moneys be made except as expressly authorized by law; and

Whereas, By reason of these conditions inseparable from our form of government, governmental operation of economic undertakings, whether federal, state or municipal, is characterized by: Extreme delay and inertia, vacillation, hesitancy and inconsistency in matters of policy; wasteful outlays in response to sectional demands; insufficient provision of funds when needed for necessary purposes; absence of close and harmonious co-operation between the legislative directorate and the executive officials; insecurity of tenure in the higher places and lack of self-interest as an incentive; frequent change of higher officials and the injection into office of new and untried men; unsuitable methods of selecting executive officials whereby such officials are often not properly qualified by expert knowledge, previous training, experience or proved capacity; hampering conditions imposed by law upon executives whereby they are deprived of necessary control of operation and of their subordinates; and

Whereas, From these conditions naturally result imperfect co-ordination, lack of qualified management, bad operating methods, and general waste and inefficiency; both the methods and the results being diametrically opposite to those which prevail in properly-managed business undertakings, which latter are governed solely by

economic considerations, and require for their success close and friendly relations between the directorate and the officials; the prompt provision of funds as required by the economic needs of the business; high capacity, long experience and special training on the part of the executive officials, assured tenure during efficiency, self-interest, and the possession by such officials of a very large degree of discretion as to outlays and operating details; now, therefore, be it

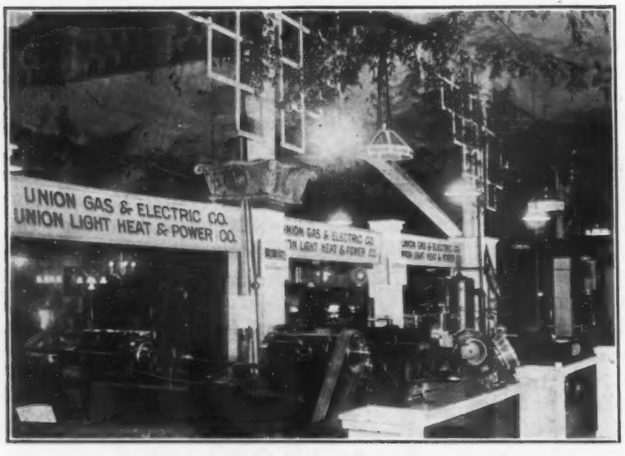
Resolved, By the Merchants' Association of New York that governmental methods in the conduct of business affairs are inherently defective by reason of the fundamental restrictions imposed by our form of government, and that governmental methods are often inefficient and wasteful and therefore unsuited to the conduct of business undertakings; and be it further

Resolved, That the Merchants' Association of New York is opposed to government ownership and operation of railroads, telephones, telegraphs, and other public utilities, believing that such utilities are far more effectively operated under private ownership, subject to public regulation, than would be possible under governmental ownership and operation, and that it would be a national calamity to subject these instruments, indispensable to the welfare of the whole country to the hampering, inefficient and wasteful methods inseparable from governmental undertakings.

CINCINNATI ELECTRIC SHOW PROVES HIGHLY SUCCESSFUL

Combined Entertainment with Electrical Displays—Show Held Early to Give Dealers Better Opportunity to Handle Christmas Trade

The Ohio Valley Electrical Exposition at Cincinnati, which was formally opened by Governor Frank Willis on Nov. 18, and lasted through Nov. 25, from the point of attendance was very successful. The exposition was again conducted under the management of the Cincinnati Electric Show Company, and was held in Music



CORNER OF CINCINNATI ELECTRIC SHOW

Hall. It was the plan this year to combine entertainment features well worth the admission price, with the practical exploitation of electricity and electrical goods.

The Cincinnati show was held in advance of America's Electrical Week this year, since last year it was learned that holding the show during the first week in December hampered local electrical dealers in handling their Christmas trade. Setting an earlier date for the show, it is thought, lengthens the Christmas shopping season.

EFFECT OF ELECTION ON CONGRESSIONAL COMMITTEES

Whether Legislation of Interest to the Electrical Industry Will Be Enacted or Not Depends on Which Political Party Controls the House

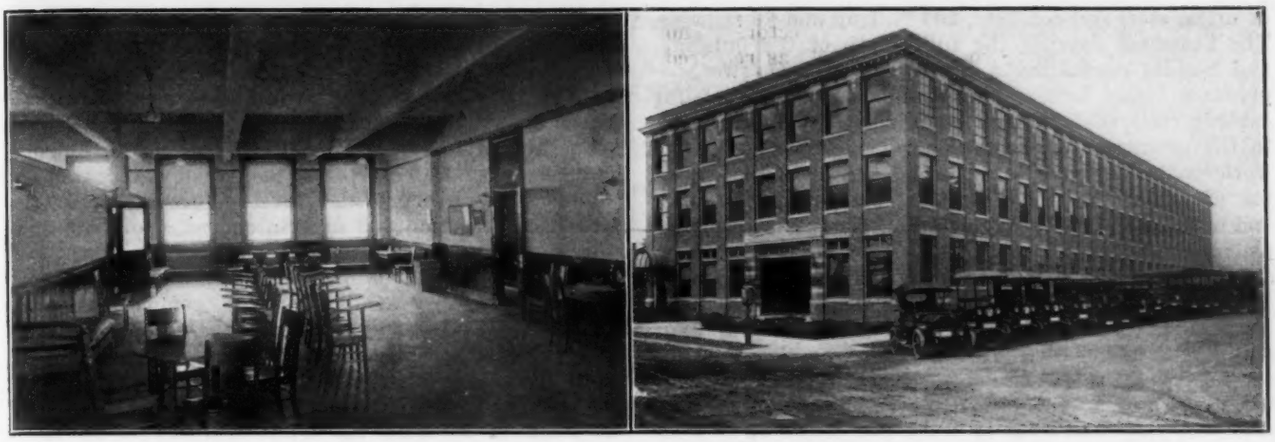
Reports received at Washington from all over the United States indicate that it is not settled whether the House of Representatives in the next Congress will be Republican or Democratic. Speaker Clark, now in Washington, asserts that his party will organize the next House with three votes to spare, and Representative Woods, chairman of the Republican Congressional Campaign Committee, claims that his party will organize the House with 218 votes, the total membership being 435. Mr. Woods does not claim that all of the 218 votes will be Republicans. He includes independents who, he says, will vote with the Republicans on the organization of the House. This uncertainty so long after the election is due to the fact that there are a number of contested seats.

Meanwhile many interests are bending all sorts of efforts to bring about the organization of a Republican House, while on the other hand many interests are endeavoring to maintain the Democratic control. These interests are not merely political. Many of the most important industries of the country are affected by the political control of the next House, for if the Republicans are shown to have control it is expected that there will not only be a speaker of the House other than the present Democratic incumbent, but the chairmanships of many important committees, with a consequent vital influence upon proposed legislation, are at stake.

If the Republicans gain control of the House, it seems proper to say that they would prevent a Democratic Senate from passing measures not in line with Republican policy, affecting tariffs, etc. Likewise, if they gain control, it is expected that there would be a new chairman of the Ways and Means Committee of the House having in charge tariff legislation and the things that are done in the name of tariff legislation. In nearly every case the committee chairmanships would go to the ranking Republican members on committees.

Under Republican control, Representative Fordney of Michigan would be chairman of the Ways and Means Committee, and the floor leader very likely. Representative Cooper of Wisconsin, one of the ablest men in the House, would take Representative Flood's place as chairman of the Foreign Relations Committee, which deals with Niagara Falls water-power matters. Another Wisconsin man, Representative Esch, would become chairman of the Committee on Interstate and Foreign Commerce, one of the water-power committees. Representative Clark of Florida would be chairman of the Patent Committee. It goes without saying, too, that the majorities on the committees, with consequent control of proposed legislation which cannot all be jammed through by the present Congress, would be Republican.

The situation presents a wide field for study by executives, for although it is definite that the people indorsed President Wilson personally, apparently they have not given him the machinery in the House of Representatives to carry out future or past policies. In fact, it is believed in Washington that President Wilson will have great difficulty in carrying out any legislation, even if the House is organized by the Democrats, because of the narrow margin they would have. An interesting item in connection with the situation is that Representative Lewis of Maryland, who has been stoutly contending and fighting for government ownership, was defeated in his race for the Senate and is out of the House, too.



SERVICE BUILDING OF UNITED ELECTRIC LIGHT COMPANY, SPRINGFIELD, MASS., AND EMPLOYEES RECREATION ROOM

Central Station Service Building at Springfield, Mass.

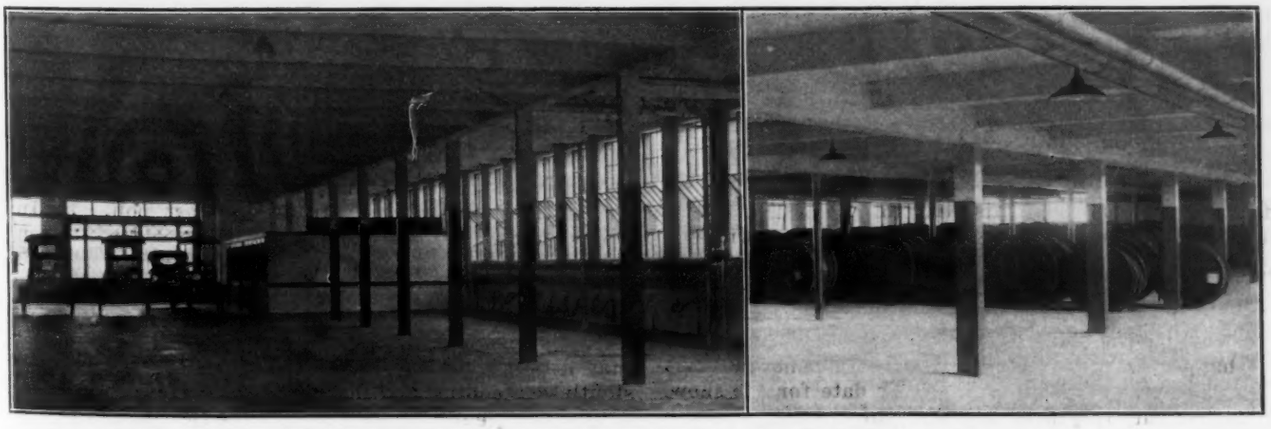
The Structure Which Was Erected at Cost of $150,000 by United Electric Light Company, Now Provides a Garage, Storage for Supplies and a Recreation Center for Employees

THE United Electric Light Company, Springfield, Mass., has recently expended about $150,000 in the erection of a new general service building, which combines the functions of an electric garage, storehouse for heavy supplies and material, employees' recreation center and headquarters of distribution work. The new building embodies on a smaller scale some of the features at present enjoyed only by large companies in the internal conduct of their construction and transportation affairs.

All the horse-drawn vehicles of the company have been abandoned for motor-driven machines, and there are now some sixteen electric trucks in service on the company's system. Before the erection of the new building, which is situated at the highest point in the city and substantially in its geographical center, although about 1.5 miles east of the business district, much heavy stock was stored in confined quarters on the east bank of the Connecticut River. The old facilities possessed some railroad conveniences, but the location of the plant at practically the lowest point in the city made the expense of haulage to various points on the distribution system burdensome. The pole yard was 2 miles away, and delays at railroad crossings were frequent, all the haulage being for a considerable distance up grade. All the cable used had to be drawn 1.5 miles from the railroad freight station. Loading and unloading facilities were inadequate at the old site.

The pole yard was located on a spur track of the Highland division of the New York, New Haven & Hartford Railroad, and the convenience of this arrangement led to the erection of the service building beside this spur track, on a 100-ft. by 700-ft. lot at Alden Street and Wilbraham Avenue. The pole yard is slightly north of this property. At the new service station all freight shipments can be delivered directly to the platform and the cost of haulage saved on large quantities of construction material, including cable, wire, transformers, lamps and metal poles. An important feature of the service building location with reference to the economical use of electric trucks in distributing material from this center is the fact that the haulage of loads is either on level or descending grades. On the return trips the trucks run lightly loaded or empty up the grades leading to the building, provided the return trips start from points below the plateau on which the service building is situated.

The building is a three-story and basement structure



GARAGE AND CABLE STORAGE IN UNITED ELECTRIC LIGHT COMPANY'S SERVICE BUILDING

of brick, steel and concrete, 200 ft. long and 80 ft. wide. The basement extends the full length of the building, and besides containing a heating plant with two low-pressure steam boilers offers ample storage space for cable in reels, coal, and any extra heavy supplies brought to the premises. The first floor is devoted to garage work, with entrances at each end and accommodations for fifty machines. On the west side of the building and opening into it through folding doors is a receiving platform 10 ft. wide and level with freight car floors, a sidetrack holding four cars and paralleling the platform so closely that no bridging is required in delivering freight. The platform is recessed into the building, and at either end of a 6-ton Otis electric elevator connecting all floors. Any cable reel can be easily rolled to an elevator in the basement, raised to the loading platform, placed on a car or truck and hauled away with minimum labor. Similarly, transformers stored on the upper floor can be handled with convenience. Confusion is avoided by having machines assigned to underground construction loaded before 7.30 a. m., the trucks used by the overhead construction forces being started out at 8 o'clock.

Storage and Charging Facilities

The second floor of the building is utilized for offices and storage and the third entirely for storage. In the garage on the first floor are provided at present charging stations for sixteen trucks. The charging apparatus is located in a compartment near one end of the room, and includes two motor-generator sets and a switchboard. One set consists of a 30-kw., 125-volt General Electric generator direct driven by a 50-hp., 440-volt induction motor. This unit was assembled by the company, the generator having been in its possession for some time, and occupies a floor space of approximately 3 ft. 8 in. by 9 ft. 6 in. The other set, which was purchased especially for this service, consists of a 50-kw. generator direct driven by a 75-hp. induction motor of General Electric make, the floor space being about 2 ft. 10 in. by 7 ft. 4 in. Thus, the specially designed unit of larger capacity is more compact than the smaller outfit, but the company found it economical to utilize its existing equipment and merely purchase a motor for driving it.

The charging switchboard consists of an eight-panel layout of the "Wotton" type, furnished by the Electric Products Company, Cleveland, Ohio. There are sixteen unit-charging panels on the board, each connected with a watt-hour meter. The rheostats are mounted on angle-irons behind the board and the usual starting connections are provided for the motor-generators. At present the 440-volt service is brought into the building from an adjacent transformer installation, but in the near future transformers will probably be placed in a special compartment reserved for this service in the basement.

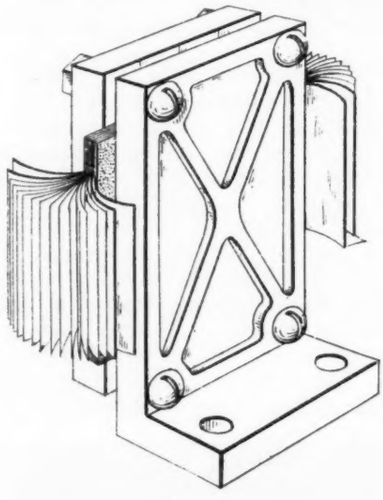
Machine Shop Equipment

A commodious machine shop adjoins the charging switchboard room and contains a 3/8-hp. motor-driven grinder, a 1-hp. 20-in. Barnes vertical drill, and a 1.5-hp. 10-in. lathe. Two-phase induction motors drive these tools. The mounting of the grinder is illustrated herewith. This equipment is bolted to a 5-ft. by 15-in. shelf, with the axis of the grinder shaft 3 ft. 6 in. above the floor, the shelf being supported by two 1.5-in. by 3/8-in. strap-iron brackets bolted into the wall. Two 5-in. emery wheels are provided and the motor speed is 3600 r.p.m. The wiring is in conduit from a convenient switch box on the wall. The company's safety committee recently placed a guard around the switch controlling the vertical drill motor, as illustrated. The guard consists of a wooden frame, painted red, and inclosing the switch blades so that it is impossible to bring the hand into contact with live parts in manipulating the switch. The guard is 7 in. long by 4.5 in. high and 6.5 in. wide, and the partitions are made of 0.5-in. stock spaced about 1.75 in. apart.

The remainder of the building contains no unusual features, with the exception that roomy and well-appointed offices are provided for the foreman of underground construction and superintendent of distribution. A large general office, fireproof vault for the storage of tracings, a commodious drafting room and liberal storage facilities are available. The company's meter laboratory was not transferred to the service building from the main offices at 73 State Street on account of the close relation between the meter and commercial departments and the permanent installation of testing equipment at the latter place, but facilities for arc lamp testing are available at the service buildings. A well-equipped recreation room, illustrated herewith, is also an attractive feature of the building.

Precision Condensers

Edmund B. Wheeler and Morton Sultzer of East Orange and New York respectively propose in patent No. 1,200,063 a method of manufacturing electric condensers which not only permits of adjusting and maintaining the capacity to a high degree of accuracy, but which also allows of a very rugged construction. Heretofore, in condensers of the stack type, it has been customary to use tinfoil between the successive layers of insulation. In view of the very low tensile strength of tinfoil, it is proposed that part of the tinfoil sheets be replaced by copper or aluminum foil, and it is found sufficient to have the last few sheets on each side of



ELECTRIC CONDENSER

the condenser formed of this stronger metal. Clamping plates are used for compressing the sheet material to a high degree. It is found that the use of a few sheets of conducting material of high tensile strength in these condensers permits an accurate adjustment of the capacity of the condensers as a whole. This adjustment is accomplished by having the capacity at first a little larger than desired, and then pulling out sheets until the desired capacity is obtained. When this stage of the manufacture has been reached, the condenser is placed in a suitable furnace and is maintained at a high temperature to remove any traces of moisture and excessive quantity of air. The condenser is then dipped into a molten mass of sealing mixture.

Brooklyn Rate Order Not Accepted

Company Applies to Public Service Commission for a Rehearing — The Principal Difference in Physical Property Valuation Is Over Depreciation.

AFTER consideration of the decision of the New York Public Service Commission, First District, directing lower rates, the Edison Electric Illuminating Company of Brooklyn asked on Nov. 28 for a rehearing. Before requesting a rehearing the company made a formal statement to the commission that the order was not accepted and would not be obeyed. As the decision in this case deals with one of the most important rate controversies in the industry the ELECTRICAL WORLD publishes herewith a summary of the principal points upon which the commission bases its valuation and resultant order for reduced rates.

Outstanding capitalization on Jan. 1, 1916, follows: Mortgage bonds, $11,209,000; convertible debenture bonds, $3,064,000; stock, $13,436,000; total, $27,709,000. In addition there were $800,000 bills payable. It is stated that these securities stand for more than the property now used for supplying electricity, and for much more than the original amount of money and property or services at their cash value received by the companies forming the system in exchange for their securities. This is due to securities issued as follows: Edison license, $945,000; guarantee fund for Edison purchase money bondholders, less system securities in fund, $258,000; securities given to promoters and contractors for Kings County Electric Light & Power Company property in excess of investment, $2,000,000; securities issued for Amsterdam Company in excess of property value, $361,000; securities in excess of par value of securities acquired of Citizens, Municipal and Edison companies, $1,701,000; stock dividends, Citizens and Municipal companies, $600,000; discounts and premiums on bonds issued and refunded, $775,000; total, $6,640,000. The original investment is thus calculated to be less than $22,000,000. On the actual capital contributed in money or property and devoted to electrical operations the total dividends and interest are calculated to have approximated 9 per cent per annum.

A detailed inventory and appraisal of physical property was made by Clifton W. Wilder, electrical engineer of the commission, in co-operation with engineers of the company.

Mr. Wilder undertook first to determine the cost of the existing system as of Jan. 1, 1914. For 65 per cent of the material and labor cost of Kings County company property and for more than 70 per cent of the material and labor cost of Edison company property prices were taken from the vouchers or other company records. Cost prices for the remainder were estimated. The totals were increased for the additions made in 1914 and 1915.

Physical property differences were not great. It does not appear to the commission that the allowances made by its engineer for contingencies, incomplete inventory, etc., were at all questioned by the company's engineers or officers, although this is the largest item of difference in the physical property valuation. "Contingencies not foreseen at the time work was planned," the decision says, "necessarily entered into the cost registered on the books and records." No testimony was found in the record to justify the claim to a larger allowance. No basis was found in the record for the additional allowance asked for engineering.

The difference on interest during construction is due almost entirely to the inclusion of land by the company in its calculation. The decision of the United States Supreme Court in the Minnesota rate case is cited as authority for the exclusion of this value.

It was claimed by the company not only that a higher valuation should be allowed on real estate, but that certain property classed by the commission engineers as not devoted to electrical operations should be included. The commission decided that the company should not be permitted to shift from cost to present value, picking and choosing as the one basis or the other yielded a higher figure. The amount allowed is about $300,000 more than the cost.

VALUATION CLAIMED BY COMPANY AND AMOUNT SUBMITTED BY COMMISSION'S STAFF, DEC. 31, 1915

	Company's Brief	Commission's Statement	Difference
Material and labor cost as per appraisal (Dec. 31, 1913)	$22,209,542	$22,209,542	.....
Contingencies, incomplete inventory, etc. (Dec. 31, 1913)	1,119,224	470,388	$648,836
Engineering (Dec 31, 1913)	1,283,303	952,557	330,746
Additions, 1914 and 1915	2,662,360	2,637,107	25,253
Interest during construction	359,648	305,000	54,648
Land	1,197,255	1,160,000	37,255
Total	$28,831,332	$27,734,594	$1,096,738
Deduct—accrued depreciation	.....	7,140,000	7,140,000
Net amount	$28,831,332	$20,594,594	$8,236,738
Deduct—amount in excess of service requirements (Sixty-sixth Street property)	.....	804,190	804,190
Net amount	$28,831,332	$19,790,404	$9,040,928
Legal organizaton, administration, expense, etc	(a) 100,000	100,000	.....
Working capital	1,325,776	1,000,000	325,776
Total	$30,257,108	$20,890,404	$9,366,704
Claims for items charged to operations:			
Lamps installed on consumers' premises	$447,994	.....	$447,994
Labor setting meters	174,949	.....	174,949
Injuries and damages during con truction	135,064	.....	135,064
Taxes during construction	298,996	.....	298,996
Legal, organization, administration expenses, etc	(b) 1,258,238	.....	1,258,238
Cost of attaching business	1,670,861	.....	1,670,861
Workmen's compensation insurance deposit	47,257	.....	47,257
Total	$4,033,359	.....	$4,033,359
Edison license	$945,000	.....	$945,000
Cost of unifying system:			
Amounts paid for securities of companies in excess of the value of their tangible property:			
Citizens Electric Illuminating Company	$573,811	.....	$573,811
Municipal Electric Light Company	1,020,475	.....	1,020,475
Amsterdam Electric Light & Power Company	366,788	.....	366,788
Expenses incident to acquisition of Edison Company stock:			
Bonds issued for expense of Edison Selling Stockholders Committee	175,870	.....	175,870
Stock issued to A. N. Brady for services in purchasing Edison stock	150,000	.....	150,000
Guarantee fund for benefit of purchase money bondholders	1,000,000	.....	1,000,000
Total	$3,286,944	.....	$3,286,944
Stock issued to Chas. Cooper in connection with organization of Kings County Electric Light & Power Company	$300,000	.....	$300,000
Total valuation Dec. 31, 1915	$38,822,411	$20,890,404	$17,932,007

(a) Included in larger amount claimed by company.
(b) This figure is amount claimed by company ($1,358,238) diminished by the amount submitted in commission's statement ($100,000).

DEPRECIATION THE CHIEF CONTENTION

Depreciation was the center of the chief controversy. The company maintained that no deduction for accrued depreciation should be made in the valuation.

"It has been the consistent determination of the commission in both capitalization and rate cases to appraise physical property on the basis of present value, deducting accrued depreciation, both physical and functional. Accrued depreciation has been uniformly determined on

the so-called straight line basis, and this method has had judicial approval in this State. That depreciation must be deducted in a valuation for rate making purposes is not open to question in view of the decisions of the United States Supreme Court in Knoxville v. Knoxville Water Company and the Minnesota rate cases. The decision of the Appellate Division of the Supreme Court in this State in the case of People ex rel. Kings County Lighting Company v. Willcox is a conclusive authority from which this commission may not deviate, for the deduction of complete and incomplete depreciation, physical and functional, from the reproduction cost new in valuations for rate making."

The question was raised as to whether the property was in excess of present needs for public service, and therefore whether there should be eliminated an amount for such property as is not used or useful for public service. This question arises in connection with the Sixty-sixth Street generating station, included by the commission engineer at approximately $1,305,000 as the cost less depreciation accrued. The decision adds: "This station is but little used relative to the investment involved. Certain additions made to the Gold Street station at a cost of about $500,000 have provided a greater generating capacity than the total capacity of the Sixty-sixth Street station."

Other differences between the amount allowed and the company claims relate mainly to overhead and intangible charges. These items, as shown in the statement on page 1093, aggregate $4,033,359. The conclusion is: "It may in fairness be contended that, no matter what are the amounts to be included in the capital accounts under the company's theory, the moneys for the items discussed under this head have been collected from consumers in the rates imposed; and that, therefore, the consumers should not be taxed a second time, for a return on capital which they have contributed. If, in the calculation of rates, the commission refuses to follow the speculations of the company as to capital and expense, but assumes as proper for the purposes of this case the operating expenses as they appear on the books, it is certain that the total amount which the company will be permitted to earn will yield a fair return on all of its property, including these doubtful items at the valuation set on them by the company itself."

The commission sees no basis in the record for a finding that the Edison licenses, based on patents which have expired, represent to-day property used or useful in supplying service, and therefore no allowance for them is made.

The excess of current assets over current liabilities other than consumers' deposits amounted at the close of 1914 to less than $900,000 and at the close of 1915 to about $1,060,000, or an average for the year of less than $1,000,000. The amount of $1,000,000 was taken.

In regard to franchise value, the commission calls attention to the decision of the New Jersey Court of Errors and Appeals in the Public Service Gas Company case, "the reasoning of which should dispose fully of the claims and arguments in this case."

Claims under the head of "cost of unifying the system" are defined as "the cost of establishing monopoly." One result of the combination was plant duplications, and, in taking into the valuation both the Sixty-sixth Street and the Gold Street plants, the commission holds that it made an allowance for what might be regarded as a development expense incident to the unification of the system. The additional amounts claimed were not allowed. The cash value of any property received for the securities issued to Charles Cooper or of the services rendered is "highly problematic."

Records of the constituent companies are remarkably complete, and they failed to reveal any considerable outlay for organization expense, financing, administration and the like. On the basis of the charges made on the books, it is submitted, says the decision, "that a fair allowance would be about $100,000. No substantial difference in the rates would result if the amount were increased to $200,000 in order to give the benefit of any doubt to the company."

DETERMINING VALUES

As the commission holds that the original capital investment for electrical operation was approximately $22,000,000, that the average annual return was nearly 9 per cent, and that the company had on Jan. 1, 1916, property valued for the purpose of this case at $22,000,000, it decides that these conclusions effectively dispose of the claims for going "value." The conclusions are summed up as follows: Cost of construction, material, labor, contingencies, engineering, $26,269,594; interest during construction, $305,000; total construction, $26,574,594; accrued depreciation, $7,140,000; present value, $19,434,594; land, $1,160,000; $20,594,594; working capital, $1,000,000; $21,594,594; organization, $200,000; total, $21,794,594.

If the higher figure is adopted for engineering the total would be in round numbers $22,000,000. With other property not devoted to electrical operations the amount would be nearly $22,200,000. "Thus," the commission concludes, "whether the basis for valuation be the actual capital invested or the present value of the property, the company will be fairly dealt with if rates are based on a valuation of its property of approximately $22,000,000."

Under the circumstances the commission concludes that "it is a question whether a return of 6 per cent would not be adequate. A return of 7 per cent is certainly generous."

ORDER OF THE COMMISSION

The order of the commission is that on and after Dec. 1, and for twelve months thereafter, the maximum rate, exclusive of installation and renewals of lamps, shall be 8 cents per kilowatt-hour. Rates are declared to be unjust, unreasonable, unjustly discriminatory and unduly preferential, and therefore for the same period they shall be 8 cents for the first two hours' average daily use of the maximum demand; 6 cents for the second two hours' average daily use of the maximum demand, and 4 cents for the excess over four hours' average daily use of the maximum demand. The maximum demand, except when determined by meter, shall be calculated as not in excess of 25 per cent of the consumers' connected load in the case of residence customers, and not in excess of 50 per cent of the connected load for other consumers, provided, however, that the maximum demand shall not in any case be assumed to be less than 250 watts.

The maximum price to be charged for the installation and renewal of incandescent lamps for lighting shall be one-half of 1 cent per kilowatt-hour. The lamps shall be tungsten lamps of standard efficiency and ratings, or other lamps of like or greater efficiency and ratings. The company shall not furnish Gem lamps, or other lamps of an efficiency of less than 1.25 watts per candlepower. If tungsten lamps of smaller capacity than 50 watts are furnished the company shall be entitled to make an extra charge, but not more than the additional cost of the installation and renewal of the smaller lamps.

No discount shall be allowed under the maximum demand power rate. The order shall continue in force until changed or abrogated.

Arrangement for Serving 1500-Volt Railway

Features of Construction, Layout and Operation Employed in the Salt Lake & Utah Railroad Company's Bringhurst Substation Connected to System of Utah Power and Light Company

BRINGHURST substation, which is the last of the four substations that have been built between Salt Lake City and Payson, Utah, to serve the 1500-volt direct-current interurban line of the Salt Lake & Utah Railroad, has been arranged and equipped in such a manner that operating conditions are considerably more favorable than those which existed in the original substation.

The older substations are located at Granger, Lindon and Springville, respectively 5.8 miles, 38.7 miles and 54.5 miles from Salt Lake City. Load conditions constituted the deciding factor in locating the new substation at Bringhurst, 23.4 miles from Salt Lake City, and approximately midway between Granger and Lindon. This location was also favorable because connections can be easily made at this point with the existing 44,000-volt lines of the Utah Power & Light Company, from which 60-cycle energy is purchased for the operation of the entire road. Under normal conditions of operation, all of the substations feed into a No. 0000 copper trolley wire, which is maintained continuous throughout the entire length (67 miles) of the road. Provisions are made, however, for sectionalizing the line in case of trouble. Paralleling the trolley are feeders which are also No. 0000. The normal rating of the older substations is 500 kw. each, but the new substation is equipped with three 250-kw. rotaries.

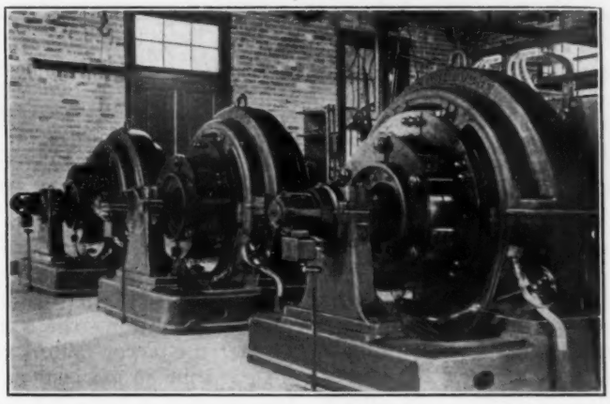


FIG. 1—ROTARY CONVERTERS THAT OPERATE IN SERIES TO DELIVER 1500 VOLTS

Since the Utah Power & Light Company's transmission line is approximately 200 ft. from the railway substation, a switch rack has been provided at the point of connection and equipped with an air-break switch to cut off the south end of the company's transmission line should trouble arise on that section. Since there is another sectionalizing station about 1 mile north of the Bringhurst station, this arrangement practically insures the continuity of a loop-line service. At the substation is another rack fitted with a similar switch to disconnect the substation circuits and lightning arresters from the tap line. Installed under this rack upon a concrete base and surrounded by a fence are the Westinghouse electrolytic lightning arresters.

The substation proper, which is 52 ft. long by 34 ft. wide by 18 ft. high, is built of brick and is provided with an asbestos-covered, corrugated-iron roof supported on steel roof trusses. All of the apparatus, which includes three 750-volt 250-kw. rotary converters and the corresponding transformers and switches, is placed in one room on the same floor level. The station and switchboard have been laid out, however, so that two additional rotary converters and the accompanying transformers can be added when necessary, giving an ultimate rated capacity of 1000 kw. Arrangements are made so that any two of the converters may be connected in series to deliver 1500 volts direct current. The operator has a small portable office provided with a desk, telephone and an electric heater.

Pin-type insulators, mounted on pipe framework, support the incoming high-tension conductors which enter the building through porcelain bushings. Immediately inside are aluminum choke coils connected by 0.75-in. copper tubing to type GA hand-operated oil

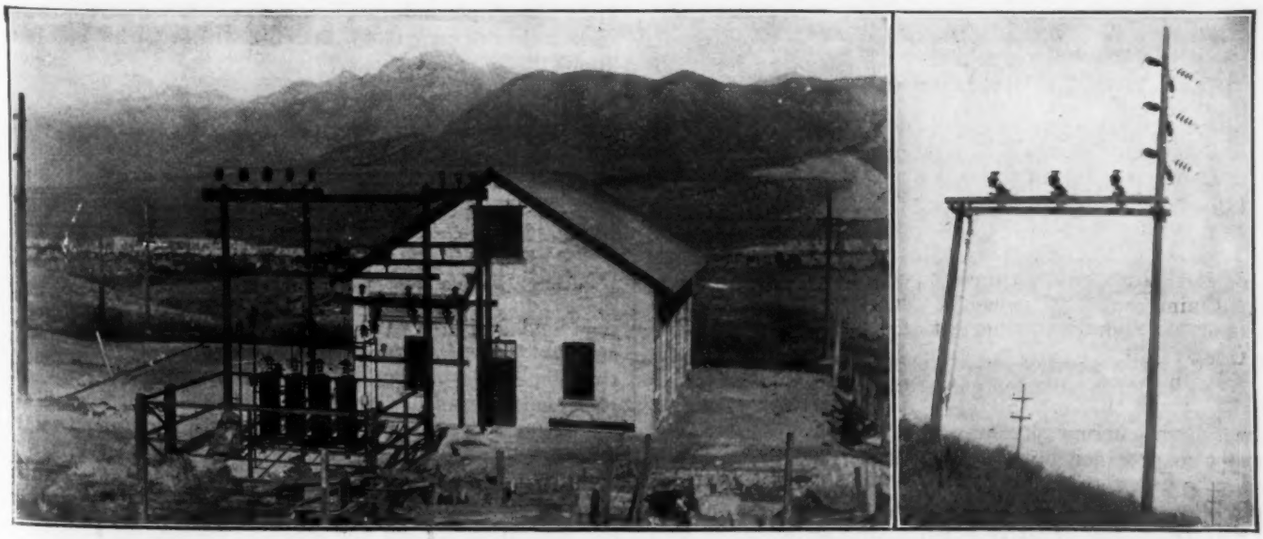


FIG. 2—BRINGHURST SUBSTATION, SHOWING INCOMING HIGH-TENSION LINES; ALSO THREE-PHASE AIR-BREAK SWITCHES AT POINT WHERE TOP LINE TO SUBSTATION CONNECTS WITH TRANSMISSION LINE

switches mounted on an elevated concrete base. These in turn are connected with the copper-tubing high-tension bus, which extends the length of the building about 15 ft. above the floor. The bus is supported at the end by strings of three 10-in. strain insulators attached to structural steel supports, and at intermediate points from the roof trusses by means of suspension insulators.

Three single-phase, core-type, oil-insulated, self-cooled Westinghouse transformers, connected delta-delta, are used to step the potential from 44,000 volts down to 460 volts, the pressure applied to the alternating-current terminals of the converters. The transformers are joined to the high-tension bus by Dossert connectors, so that a defective transformer may be readily disconnected to permit open delta operation. Each unit has three separate secondary windings, rated at 75-kva. each.

One of each set of these windings is connected with each converter so that any two machines may be operated in series on the direct-current side. Taps are provided on the transformers in order that the low-tension voltage may be adjusted and low-tension energy available for starting the rotaries. Although starting taps are provided on two end transformers only, connections can be readily made with the middle unit should it be desired to use this for open-delta operation.

Low-Tension Bus Structure and Converters

Flat bare copper busbars, ⅛ in. by 3 in. in section, are used for the low-tension circuit, and are supported on a pipe framework 6.5 ft. above the floor level. To permit operating any two of the three converters in series, nine copper bars are employed, three for each secondary. Between these and the converters are 500,000 circ. mil cables, which are inclosed in 2-in. fiber conduit clamped to pipe framework about 6 in. above the floor.

Each converter has a continuous rating of 250 kw. at unity power factor, 50 per cent overload rating for two hours and a momentary rating of 300 per cent normal load. The series fields of these machines tend to maintain a high power factor on heavy loads and produce a slight increase in voltage. Since the transformers have high internal reactance, a slight control of voltage is obtained through manipulation of the field rheostats.

Carbon-contact circuit breakers with adjustable overload trips are provided for the machine circuits and

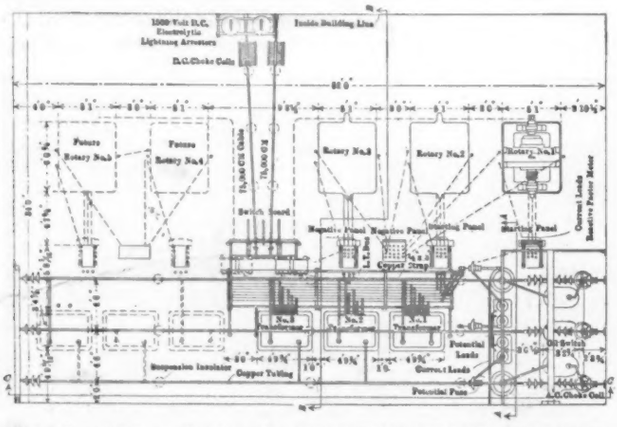


FIG. 3—CROSS SECTION OF SUBSTATION SHOWING RELATIVE POSITIONS OF APPARATUS

two direct-current feeders. Low-voltage release coils are also provided on the machine breakers. Readings may be taken on each machine as well as on the feeder circuits by means of a 2000-volt scale voltmeter. Mounted on the negative panel of the switchboard is a single-pole knife switch and a triple-pole double-throw oil switch, by means of which any two of the converters may be connected in series on the direct-current side. As the payment for power is based on the maximum demand as well as the energy consumption, both integrating and graphic wattmeters are provided. All instrument wiring is of multi-colored cables placed in 1-in. iron conduits. The direct-current feeders consist of 750,000-circ. mil conductors suspended from steel

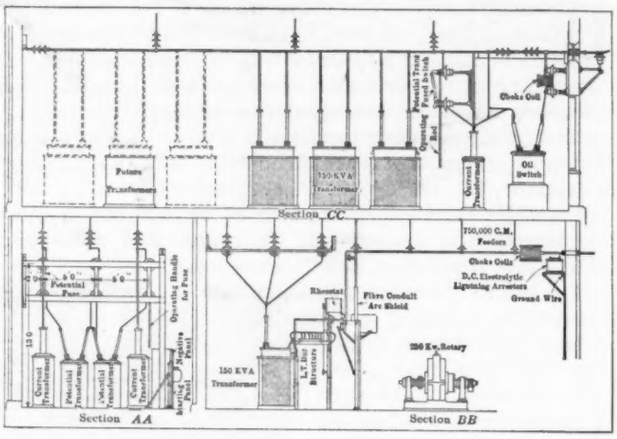


FIG. 4—ARRANGEMENT OF CONVERTING, TRANSFORMING AND SWITCHING EQUIPMENT

messenger wires by Marlin hangers. Reverse-energy relays, choke coils and electrolytic lightning arresters are connected with the direct-current feeders. Under present conditions, the converter rheostats are adjusted so that the power factor will be unity at about 200 amp. load (about 86 per cent normal load), as at this setting the current is leading for greater loads.

Four 200-watt lamps placed in deep-bowl reflectors are suspended 14 ft. above the floor over the rotary converters to light the main part of the station. Illumination for the high-tension section of the building is provided by five 60-watt bracket lamps placed 12 ft. above the floor. Each lamp in this section is protected from static charges by means of a grounded wire lamp guard.

All of the equipment was supplied and erected by the Westinghouse Electric & Manufacturing Company according to plans prepared under the supervision of M. R. Lott, electrical engineer of the Salt Lake & Utah Railroad. The total cost of the substation building and equipment for the present installation was $58 per kilowatt of normal rated capacity. When the future installation is completed, the cost will be about $39 per kilowatt.

Dry Cell with Gelatinous Electrolyte

A rather ingenious solution for obviating the drying-out trouble of the electrolyte in dry cells, and the deterioration of the electrode even when on open circuit, is made the subject of patent by Edward McGall and M. D. Malcomson of Orange, N. J. It has been discovered that by using a colloidal gelatinous electrolyte of caustic soda and starch, the ordinary defects of dry cells are largely done away with, and that when, for example, zinc and oxide of copper are employed the efficiency of such cell is greatly increased, being, in fact, greater than that of a wet primary battery employing similar electrodes and an alkaline electrolyte. This is due, in part, to the starch grains or other particles of organic material in the colloidal solution apparently increasing the ionization of the electrolyte whereby the capacity and conductance are increased.

Winning the Electric-Cooking Load—II

BY S. M. KENNEDY
General Agent Southern California Edison Company

Last week, in the first installment of this article, Mr. Kennedy discussed broadly the subject of electric cooking and the types of electric-range equipment now available for use. In this second and concluding chapter the author shows by means of figures and load-curves the significance of the electric-range load with respect to central station output and load factor.—EDITORS.

IT is well to get away from the idea of thinking in hundreds and to think in thousands when considering future electric cooking devolpment. Fig. 5 shows the estimated curve for a load of 3000 ranges, and Fig. 6 shows the range load of 3000 ranges superimposed upon the load of a company having a summer peak demand of approximately 26,000 kw. and a load factor equaling 60 per cent. The cooking curve will vary somewhat in different parts of the country, but not to any great extent.

The central station company to find the value of this load must convert the curve into kilowatt-hours and dollars and cents. Again we revert to the experience gained, and it develops that under average conditions each consumer cooking electrically should use about 100 kw.-hr. per month. One thousand consumers should consume 100,000 kw.-hr. monthly. Apparently, the average rate given by the experienced companies for cooking is 3 cents per kilowatt-hour. Thus we have

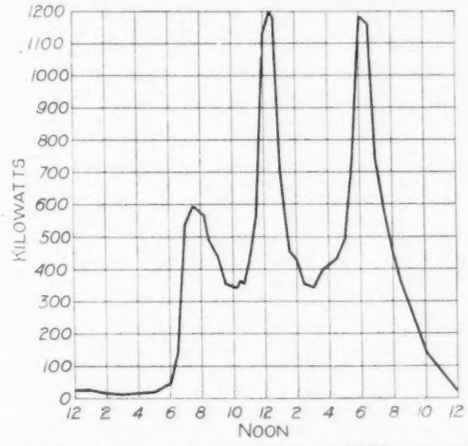


FIG. 5—ASSUMED LOAD CURVE OF 3000 RANGES

average conditions producing a monthly income of $3 from each range, being $36 per year, or a grand total of $36,000 per annum from 1000 ranges. These are conservative figures.

GOING AFTER THE BUSINESS

To obtain the cooking load, the power company must of necessity go out after it. The co-operation of the jobber, dealer and contractor is desirable, but the representatives of the central station must do the promotion work. Good salesmen and demonstrators must arouse interest and answer inquiries. Appliances must be demonstrated to prospective users and rates and costs explained, and only the power company can afford to make the expenditure to do this work as it should be done. There are many difficulties which must be carefully met, but they are not insurmountable. After sales are made and ranges installed, they must be constantly watched and nursed, until the consumer thoroughly understands the operation and is satisfied with the monthly cost. Each pleased consumer becomes a booster for electric cooking, and with good reason. The more ranges installed with satisfied consumers the more easily can future sales be made. Fig. 7 shows a half-mile square in a rural district in southern California. There are sixteen houses in the block, and fourteen are using electric ranges. This in spite of the fact that natural gas mains are only 1000 ft. distant. One householder was induced to purchase a range, which proved to be satisfactory, and the remaining thirteen followed in less than four months. This experience has been repeated in several sections on the same company's system.

The power company must educate its own employees, its customers and the general public as to the advantages of electric cooking. Nothing else will win the business. The education must be through the efforts of truthful salesmen, skillful demonstrators and judicious advertising. The cost of appliances and installation of same must be reduced to a minimum. Rates for cooking service must be reasonable, and based upon the value of the load to be obtained, rather than upon the competition to be met. Then there is the service. The electric range is the most exacting appliance that the power company has yet exploited, and continuity of service is more important than ever. Rebuilding and

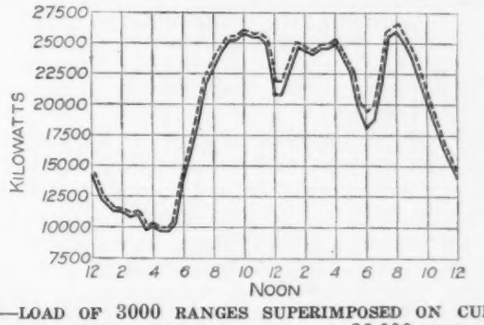


FIG. 6—LOAD OF 3000 RANGES SUPERIMPOSED ON CURVE OF SYSTEM HAVING MAXIMUM PEAK OF 26,000 KW. AND 60 PER CENT LOAD FACTOR

repairs to lines must be looked after at such times as will not interfere with domestic work. Street cars may fail to move, and the public can still walk or use a jitney; if power is cut off the irrigation of an alfalfa field may be postponed a week; washing and ironing may be put off for a day, and if the lights go out consumers may burn candles or go to bed. But it is different if you ask a man to forget about his breakfast, wait until evening for his lunch, or go to bed without his dinner.

The electric range also demands good regulation, and this is sometimes difficult to supply, particularly in the rural districts. Three to 4 per cent above or below normal is the limit. The variation in heat is much greater than the variation in voltage. A 4 per cent increase or decrease in voltage would produce 8 per cent increase or decrease in heat. If voltage drops too far the range will not give sufficient heat to do the cooking properly; if voltage goes too high the heating elements are endangered. At the start, the range load produces greater distribution problems than problems of generation. Doubtless the generating problems will follow later.

The cost to the power company of adding electric-range business requires consideration. The promotion expense is necessarily heavy, until a load is obtained, although this expense proportionately decreases as the load increases. It will be found difficult to obtain an average price on the range and installation on consumers' premises, greater than the actual cost. The

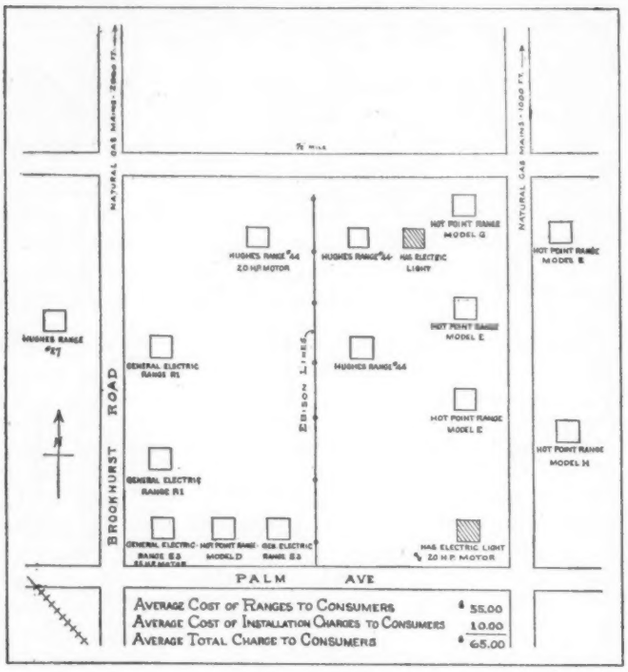

BROOKHURST ROAD
PALM AVE
EDISON LINES
NATURAL GAS MAINS - 1000 FT.
NATURAL GAS MAINS - 2000 FT.
HUGHES RANGE #44
20 HP MOTOR
HUGHES RANGE #44
HAS ELECTRIC LIGHT
HOT POINT RANGE MODEL G
HOT POINT RANGE MODEL E
HUGHES RANGE #27
GENERAL ELECTRIC RANGE R1
HUGHES RANGE #44
HOT POINT RANGE MODEL E
HOT POINT RANGE MODEL H
GENERAL ELECTRIC RANGE R1
GENERAL ELECTRIC RANGE E3
HOT POINT RANGE MODEL D
GEN. ELECTRIC RANGE E3
HAS ELECTRIC LIGHT & 20 H.P. MOTOR
AVERAGE COST OF RANGES TO CONSUMERS $ 55.00
AVERAGE COST OF INSTALLATION CHARGES TO CONSUMERS 10.00
AVERAGE TOTAL CHARGE TO CONSUMERS $ 65.00

FIG. 7—FOURTEEN OF THE SIXTEEN HOUSES SHOWN IN THIS CALIFORNIA SUBURB ARE EQUIPPED WITH ELECTRIC RANGES

salaries of salesmen and demonstrators, the cost of advertising and maintenance of show rooms must be charged to new business expense or some similar account. The average additional capital expenditure on account of distribution for each range installed is approximately $60, made up in increased service, meter and transformer capacity. Range installations must be made with great care. Fig. 8 illustrates the instructions sent by a Pacific coast company to its agents and foremen in charge of this work.

THE CONSUMER'S POINT OF VIEW

An electric cooking load will never be acquired by the power company unless the consumer is obtaining what was promised when he purchased his range. He was told what seemed to him to be fairy tales about the magic of electricity, and he was hypnotized by what he saw the demonstrating wizard accomplish on the range without fire or flame. He was in a dream, and willingly or unwillingly he signed an agreement. Did the dream ever come true? Beyond all doubt, if the sale was properly made, the dream was duly realized. It may be presumed that the prospect is convinced that the electric range can actually do cooking in a manner equal to the household necessities. What, then, are the advantages of electric cooking—what is the cost and why does not every prospect become a consumer? Again we turn to experience and quote the words of a lady living in southern California who has been "cooking by wire" for some years:

"Cooking by electricity is the ideal method of cookery. I make this statement after twelve years of actual experience in electric cooking. Previous to 1904 I had used for cooking wood, coal, oil and gas. Since that time I have used electricity—from the crude, experimental oven and stove of 1904 to the highly perfected appliances of to-day.

"Out of the richness of this experience I am enthusiastic in saying that cooking by electricity is the ideal method for convenience, cleanliness, efficiency, saving of labor, safety, healthfulness, economy.

"It is convenient in that you press a button, insert a plug, or snap a switch and your heat is on.

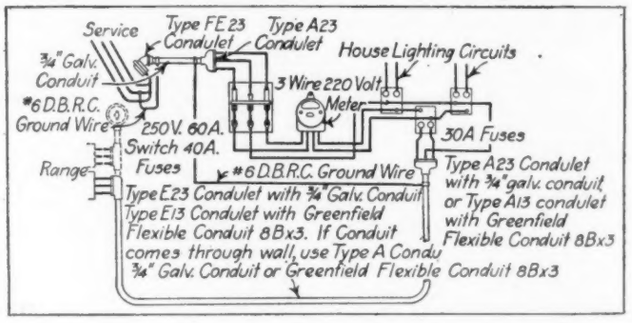
"It is cleanly in that it causes no dust, no soot, no ashes, no smoke, no noxious gas, no discolored walls, no tarnished cooking utensils.

"It is efficient in that it affords perfect regulation of heat, from a high degree to one that merely keeps food warm. It gives even, steady heat, which is obtainable by no other means. It is equally successful for rapid and slow cooking. A little experience shows one the degree of heat which is needed for the cooking process, and beyond this one need have no concern.

"It is labor saving in that it does away with sooty cooking utensils, soiled kitchen walls and floors—in short, it practically eliminates dirt.

"It is safe in that there is absolutely no danger from fire or from gases. In any other method of cooking these two dangers are ever present.

"It is economical in that it eliminates waste. Food cooked by electricity is seldom badly cooked. Electricity is economical in that it need be used only for the time that the food is actually cooking. There is no waste heat in electric cooking—a thermometer held a few inches from an electric stove will register body heat. For cooking in an electric oven, after preliminary heating, the heat may be turned low, and this is usually the case in other methods of electric cooking. It also admits of the utmost economy in cooking utensils. Several of my cooking utensils have been in daily use for twelve years and still show no signs of wear.


Service
Type FE 23 Conduit
Type A23 Conduit
House Lighting Circuits
¾" Galv. Conduit
3 Wire 220 Volt
#6 D.B.R.C. Ground Wire
Meter
250V. 60A. Switch 40A. Fuses
30A Fuses
Range
#6 D.B.R.C. Ground Wire
Type A23 Conduit with ¾" galv. conduit or Type A13 conduit with Greenfield Flexible Conduit 8Bx3
Type E23 Conduit with ¾ Galv. Conduit
Type E13 Conduit with Greenfield Flexible Conduit 8Bx3. If Conduit comes through wall, use Type A Condu
¾" Galv. Conduit or Greenfield Flexible Conduit 8Bx3

1. Service entrance wire to be three No. 8 D.B.R.C. wire in 0.75-in. galvanized conduit with a type FE23 galvanized condulet on the outside of the building and type A23 galvanized condulet on the inside. Flexible conduit not to be used. The conduit to be grounded to the neutral of the overhead system where it enters the service conduit, ground wire to be No. 6 D.B.R.C. wire.

2. Main line switch to be 60-amp., 250-volt, three-pole, single-throw switch, G.E. catalog No. 102,960, equipped with two 40-amp. cartridge fuses, G.E. catalog No. 34,959, the neutral to be tied through with a copper strip.

3. Meter to be three-wire, 220-volt, of suitable size. If there is more than one lighting circuit in the house, balance them on the three-wire.

4. Use two-wire single branch block G.E. catalog No. 61,935, equipped with 30-amp. plug fuses for the two outside wires of the 220-volt going to the range and take the neutral straight through without fuses. Use Greenfield flexible conduit, type 8BX3, or 0.75-in. galvanized conduit with three No. 8 D.B.R.C. wires to connect from cut-out block to range. Equip conduit with a type "A" condulet at cut-out and a type "A" condulet at range if the conduit comes through wall, but if it comes up through floor use a type "E" condulet. Conduit to be grounded to service conduit with No. 6 D.B.R.C. wire. Frame of range not to be grounded.

5. When switch is to be installed at range, use H. & H. No. 442, 30-amp., 250-volt, double-pole indicating rotary switch on type H220 condulet, and type C23 condulet instead of type E23 condulet. If conduit comes through wall, use type LB223 condulet. These condulets are for 0.75-in. galvanized conduit. Use condulets type H120 and type C13 or type LB113 with Greenfield flexible conduit type 8BX3.

6. Special attention is to be paid to the location of the range to see that a person can not touch any grounded pipe and a heating element at the same time. If the range is installed on a tile, concrete, or other grounded floor, use special insulating mat.

FIG. 8—INSTRUCTIONS FOR INSTALLING ELECTRIC RANGE ISSUED BY PACIFIC COAST COMPANY

"For these reasons electric cooking is the ideal method."

The cost of cooking by electricity, as compared with other methods, must be carefully considered. Under ordinary conditions cooking by gas appears to be less expensive than by electricity. It might be pointed out, however, that for many years gas lighting has been much cheaper than electric lighting. Still, and in spite of the difference in cost, the majority of people insist on electric lighting for their homes and places of business, and to-day it is not usual to see gas used for illuminating purposes where electricity may be obtained. Why? Because electric lighting has compensating advantages which make the difference in cost a negligible quantity. It is the compensating advantages in electric cooking which make the comparison in costs with other fuels of minor importance. When all the cost is figured electric cooking is the least expensive fuel, if only three of the many advantages are considered, namely, safety, sanitation and saving. No open flame nor deadly match —pure atmosphere, uncontaminated with disagreeable fumes and poisonous gases. Food conserved in cooking —not wasted or consumed.

REASONS FOR DELAY IN TAKING UP ELECTRIC COOKING

As to why every prospect does not immediately become a consumer there are eight principal reasons, which follow in the order of their importance: (1) First cost—including installation; (2) anticipated high operating cost; (3) lack of economical water heating facilities; (4) slow operation; (5) skepticism and lack of confidence; (6) disposition of old equipment; (7) satisfaction with present means of cooking; (8) necessity for heating kitchen during winter months.

These objections are being gradually overcome. The "first cost" is steadily decreasing. Efficient ranges are selling for less than they did formerly, and the central stations are making the installation easy—by low prices and deferred payment. "Operating costs" are decreasing on account of lower rates and a better understanding of how to handle the electric range. "Electric water heating" is not the problem it was, and can now be done with reasonable economy by means of newer appliances. "Slow operation" is no longer excusable. For a while both manufacturers and central station managers were afraid of burners requiring a consider-

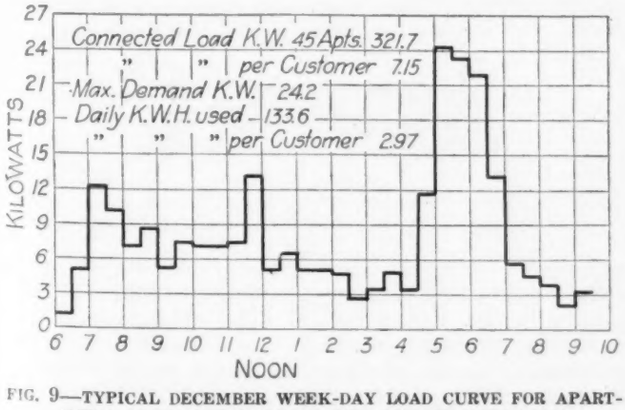


FIG. 9—TYPICAL DECEMBER WEEK-DAY LOAD CURVE FOR APARTMENT HOUSE WITH FORTY-FIVE RANGES INSTALLED

able capacity, the fear being that the daily peak would be seriously affected. That fear has been eliminated, and quick operation is obtained by using units of sufficient capacity. "Skepticism and lack of confidence" disappear before education. "Disposition of old equipment" is a question which each central station must solve, and the rapidity of the solution will depend on the anxiety to obtain cooking load. "Satisfaction with present methods" is lack of information. Present methods are all right until better ways are learned. "Necessity for heat in kitchen" in some parts of the country is a condition which requires skill in handling, but the adjustment of rates should take care of many cases, and even in winter months the electric equipment in the kitchen may be used as an auxiliary.

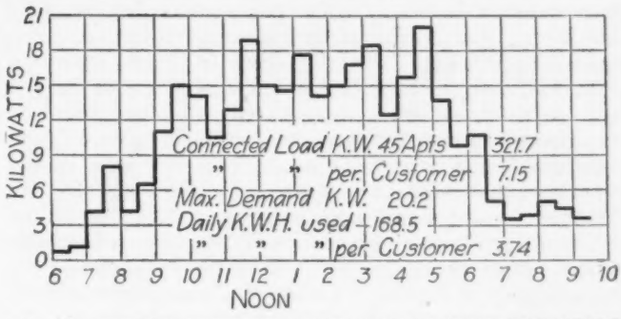


FIG. 10—TYPICAL DECEMBER SUNDAY LOAD CURVE FOR APARTMENT HOUSE WITH FORTY-FIVE RANGES INSTALLED

While the electric range is the ideal means for cooking in most homes, it is exceptionally advantageous for the apartment house. Apartment house tenants are transient. Each new occupant insists on having the woodwork repainted and the walls retinted. The electric range does away with all smoke, grease and dirt, and frequent repainting becomes unnecessary. The electric range can be made to fit into the most limited kitchen space. In apartment houses hot water is usually supplied from the basement, so that this problem does not enter into the cooking work. There is no menace from fire and asphyxiation where electric ranges are installed in apartment houses. Fig. 9 and Fig. 10 show curves of apartment house combined cooking and lighting loads. Quite recently a lady living in a Western city, who was about to construct a high-class apartment house, wanted to learn some facts from independent sources regarding the operation of electric ranges in such buildings. From the local power company she was given the addresses of thirteen apartment houses located in different parts of the United States in which cooking is done by electricity, and wrote a letter to each one, stating who she was and why she wrote. The letter contained these questions:

"Does the electric range take care of the cooking requirements of your tenants?

"What is the rate charged for electric energy for cooking purposes, and what are the average monthly bills for service supplied to your tenants?

"As a result of your experience would you recommend me to equip my apartment house with electric ranges?"

Replies were received from ten owners, and all stated that the electric range fully took care of the cooking requirements of tenants. The rate paid for electricity for cooking averaged 3 cents per kilowatt-hour, and monthly bills varied from $1.75 to $3.50, the average being about $2.15. All advised the equipment of the new apartment house with electric ranges, as being clean, safe, economical and modern. The unanimity of the answers sent was a revelation to the lady who wrote, and also to some employees of the local power company.

THE BENEFITS OF ELECTRIC COOKING

It has been truthfully stated that the properly constructed electric range has all the good points of older methods of cooking without any of their disadvantages. It has also many advantages which are not possessed by other cooking appliances using different fuels. The best answer to all criticism and the best test of all work

is results. The best evidence of satisfactory results is the pleased consumer. A satisfied lighting customer is usually passive in his expressions of praise. A pleased power consumer expresses his pleasure in a business-like manner, but a pleased electric cooking consumer at once becomes an enthusiastic advertiser.

Perhaps, after all, cooking is the most important part of daily life, and to have this well done calls forth more than ordinary praise. To do this work under healthful conditions, and at the same time scientifically, is the acme of perfection. Every housewife knows that if a plant or flower is kept in a room where gas is used it will presently wither. Yet a potted plant may stand on the electric stove for months, without showing any deterioration in growth or appearance. It is a logical deduction that what is bad for plant life is equally bad for food products and human beings. The use of the electric range avoids any chance of vitiation or contamination. It is an axiom that the luxury of yesterday is the necessity of to-day; its truth has been demonstrated in countless ways in the last quarter century. Progression in thinking is paralleled by progression in living, and it follows that methods of cooking, so important a procedure in the life of mankind, call for as much concentration and inventive skill as human ingenuity can devise. Domestic science is now taught in our high schools and colleges, so that the well educated young woman cannot expect to come under that designation unless she can cook a meal scientifically. As an aid to that end the electric range is far ahead of all its forerunners; it is to the kitchen, in the preparation of food, what the scientific course in agriculture is to the student, placing him at untold advantage over the "guesswork" farmer in the cultivation of the soil. There need be no guesswork about cooking when the modern electric range is the medium.

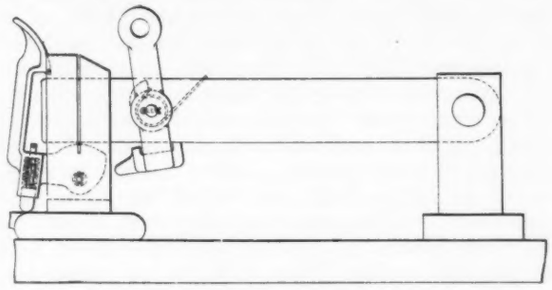
However, only a small proportion of the public has been informed regarding the advantages of electric cooking. It is true that interest is now being created in the subject through various agencies, still there is a note of interrogation in the public mind regarding the ability of the electric range to do the work and the reasonableness of the operating expense. There are many interests concerned in the growth of this branch of development. The engineer from the moment the first drawing is conceived until the range is connected for service. The manufacturer, as a producer of an article which should have a big present demand, and an unlimited future growth. The power company, anxious for a larger off-peak load, a higher load factor and a market for energy at fair rates. Education and demonstration will overcome doubt and want of knowledge, and will build up confidence. Proper education of the public in this regard can only be brought about by the earnest and intelligent co-operation of engineers, manufacturers, dealers, contractors and power companies, and with such education the desired results will surely follow. Electric cooking is not a theory; it is a fact, and must soon become an important factor in the load of every progressive power company.

Making the Stack Do Double Duty

The Meriden (Conn.) Electric Light Company is a believer in electric-sign publicity, and has practised what it preaches, in the case of the electric-lighted maxim on its plant stack at Meriden. The letters of this lofty electrically lighted sign which read downward on the stack are very effective against the black background of the night sky, and the text: "Use Electric Light," appears on both the north and south sides of the stack. The plant is in the heart of the town where the signs are visible from the busiest streets.

Automatic Latching Device for High-Tension Knife Switches

A latching device which is efficient and simple in construction and which can be applied to knife switches of existing types without alteration in their structure, is suggested in a patent to George Linton Cristman and Harold Baxter of Wilkinsburg, Pa.

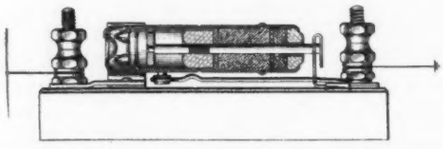


AUTOMATIC LATCH FOR HIGH-TENSION SWITCH

When it is desired to open the switch, a hook is manually inserted in an opening in a releasing lever attached to the knife blade of the switch, and when given a downward pull causes the head to strike against the face of a hook or latch member, and thus effect a movement which permits the switch blade to be pulled away from the contact. When the switch is again closed, the corner of the blade engages the shoe of the hook or latch member so as to permit the blade to be inserted between the jaws of the contact. When the blade reaches its closed position, the latch is again in position to retain the blade against undesired or dangerous displacements.

Short-Circuiting Device for Lightning Arrester

Dr. Charles P. Steinmetz in a patent No. 1,201,646, assigned to the General Electric Company, provides for a device for short-circuiting a lightning arrester when the heat generated by the discharge of the spark gap becomes excessive. The lightning arrester unit comprises a hollow or tubular electrode of metal which contains an inert atmosphere and a co-operating disk electrode separated to form an annular spark gap. For protecting the arrester from heavy and continuous discharges across the spark gap between the electrodes there is



PROTECTIVE DEVICE FOR LIGHTNING ARRESTER

arranged a short-circuiting device comprising a metal spring conducting member yieldingly mounted to connect with the disk electrode. The spring member is held away from the electrode in a non-short-circuiting position, by means of a piece of fusible material having a high melting point. Under normal conditions the short-circuiting device is inoperative as the heat generated by intermittent discharges of the arrester are insufficient to melt the fusible material, but upon a continuous and excessive discharge of the arrester due, for instance, to a cross of the lightning arrester circuit with a power line, the heat generated is sufficient to melt the fusible material and the arrester is short-circuited, thus preventing the destruction of the arrester.

Results of September Central Station Operation

Earnings Amount to $32,900,000 and Output to 1,920,000,000 Kw.-Hr.—Estimated Earnings for 1916 More Than $400,000,000 and Output to Exceed 22,000,000,000 Kw.-Hr.

SEPTEMBER electric light and power utility operations, according to the returns received by the ELECTRICAL WORLD, show in comparison with September, 1915, a gain of 16.1 per cent in income and 24 per cent in output. The rate of gain in income is the greatest the industry has known during the last three years with the exception of that registered in March last, when the rate was 17.8 per cent.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1915	1914	Per Cent Increase	1915	1914	Per Cent Increase
Oct.....	65	20,112,813	18,329,490	9.8	1,087,786,658	949,288,459	14.7
Nov.....	65	21,899,048	19,720,232	11.6	1,150,669,073	948,704,941	21.3
Dec.....	64	23,418,774	20,962,264	11.8	1,230,655,404	1,004,108,399	22.5
		1916	1915		1916	1915	
Jan.....	65	25,286,336	22,352,721	13.2	1,200,672,452	984,205,683	22.0
Feb.....	65	22,133,485	19,175,537	15.3	1,121,452,738	869,537,132	29.1
March...	65	22,027,627	18,722,742	17.8	1,212,363,217	969,888,339	25.2
April....	64	21,206,946	18,375,014	15.5	1,137,602,995	920,464,917	23.1
May.....	64	20,345,529	17,559,786	16.0	1,170,143,766	944,681,881	24.0
June....	64	20,254,732	17,551,769	15.4	1,170,679,212	968,724,416	21.0
July.....	64	19,760,120	17,301,686	14.2	1,174,374,141	976,704,993	20.4
Aug.....	64	20,438,831	17,802,151	15.0	1,260,827,472	1,014,280,523	24.4
Sept....	61	20,080,732	17,323,722	16.1	1,172,115,049	945,992,354	24.0

On the basis of the returns received the September, 1916, earnings were $32,900,000, as compared with $28,400,000 for September, 1915. These earnings are from the sale of electric energy only, and all inter-company transactions have been eliminated. The output during September last was 1,920,000,000 kw.-hr., as compared with an output for September, 1915, of 1,550,000,000 kw.-hr. Here the output is that energy that is sold only. All inter-company transactions for which no income is received have been deducted from the earnings.

For the first three quarters of the current year the earnings totaled $300,000,000, so that the estimates of earnings for 1916 are over $400,000,000. The output for the first three quarters of 1916 was 16,603,000,000 kw.-hr., on the basis of which the estimate for the year

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.
INCOME:										
Group 1.....	10.2	10.7	14.1	16.0	13.9	14.4	14.9	13.8	13.9	15.3
Group 2.....	13.8	21.3	20.0	18.5	17.0	17.5	17.7	16.8	19.1	19.9
Group 3.....	19.8	18.3	20.7	28.1	24.7	26.2	21.8	19.5	20.9	18.4
Group 4.....	13.6	13.1	15.7	17.3	17.4	15.1	11.0	9.0	9.5	11.5
Group 5.....	13.0	7.2	18.5	26.5	16.1	24.0	15.3	12.2	14.9	13.3
OUTPUT:										
Group 1.....	19.0	19.0	25.4	22.0	20.0	21.3	18.7	18.1	21.4	20.4
Group 2.....	31.5	28.0	40.6	28.1	25.5	18.0	17.5	22.9	33.0	33.9
Group 3.....	33.0	33.2	39.6	39.0	37.7	40.0	21.8	27.8	31.1	29.2
Group 4.....	16.3	22.6	29.7	18.2	22.7	23.0	19.3	16.1	23.0	24.0
Group 5.....	9.7	8.5	22.4	29.9	32.0	33.2	19.0	11.6	16.8	15.3

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.
INCOME:										
Group 1.....	14.8	16.5	18.0	21.5	16.0	17.0	16.4	12.6	9.6	16.5
Group 2.....	16.1	15.4	19.9	19.0	21.2	19.5	19.8	20.6	15.1	20.0
Group 3.....	22.8	22.1	29.7	38.7	15.5	24.0	18.3	21.2	14.0	16.7
Group 4.....	9.6	11.3	15.1	18.1	13.2	13.5	7.2	6.2	11.1	9.7
Group 5.....	23.5	20.6	26.3	54.5	27.6	27.0	21.7	14.9	17.5	18.3
OUTPUT:										
Group 1.....	26.2	29.0	38.5	30.9	25.0	28.2	30.0	19.2	31.3	34.0
Group 2.....	26.5	26.0	36.8	27.8	31.4	33.2	26.3	14.1	32.0	32.7
Group 3.....	22.5	39.5	41.6	49.0	38.1	43.0	15.0	31.4	48.0	34.5
Group 4.....	18.5	15.0	23.0	17.4	36.1	30.0	21.0	26.6	39.4	33.1
Group 5.....	14.5	22.6	25.6	58.7	71.8	54.4	31.7	13.5	21.3	27.4

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase
INCOME	October...	66	2,327,214	2,073,059	12.3	68	8,096,982	7,550,808	7.2	57	5,820,653	5,153,314	13.0	88	3,798,012	3,477,051	9.3
	November.	66	2,472,539	2,188,049	13.0	67	8,804,805	8,158,589	9.0	57	6,342,582	5,554,226	14.2	88	4,069,995	3,703,124	10.0
	December.	66	2,817,557	2,448,813	15.0	67	9,335,396	8,529,866	9.4	57	6,983,909	6,063,349	15.1	88	4,150,045	3,773,810	10.0
			1916	1915			1916	1915			1916	1915			1916	1915	
	January...	66	2,819,144	2,432,177	15.0	67	9,589,347	8,564,488	12.0	57	7,834,831	6,717,799	16.6	88	4,182,114	3,823,156	9.4
	February..	66	2,599,760	2,185,967	18.8	67	8,978,797	7,854,345	14.3	57	6,660,062	5,568,337	19.7	88	3,761,364	3,443,182	9.3
	March....	66	2,595,777	2,122,177	22.0	67	8,998,962	7,660,667	17.5	57	6,470,612	5,394,250	20.1	88	3,787,925	3,386,286	11.9
	April.....	64	2,221,544	1,898,749	17.0	67	8,794,056	7,596,567	15.8	56	6,289,092	5,292,974	19.0	88	3,825,701	3,520,381	8.8
	May.....	65	2,103,585	1,788,219	17.0	67	8,226,231	7,131,063	15.4	56	6,085,407	5,123,132	18.7	88	3,874,270	3,469,871	11.6
	June.....	65	2,208,994	1,906,233	16.0	67	8,045,839	6,905,114	16.5	56	6,007,742	5,143,452	16.9	88	4,017,208	3,539,137	13.5
	July.....	65	2,130,684	1,875,824	13.7	67	7,832,928	6,621,832	16.4	56	5,926,776	5,095,855	16.3	88	3,755,712	3,493,032	7.6
	Augus....	65	2,183,931	1,919,287	14.0	67	7,956,801	6,832,904	16.5	56	6,195,808	5,266,147	17.7	88	3,883,835	3,582,756	8.4
	September.	63	2,170,500	1,864,292	16.4	67	8,391,031	7,225,569	16.1	56	6,505,593	5,537,868	17.8	75	3,013,608	2,695,993	11.8
KW.-HR. OUTPUT	October...	66	82,568,951	69,882,867	18.3	68	400,516,741	353,685,472	13.3	57	305,962,017	268,972,416	13.7	88	292,885,613	251,095,356	16.8
	November.	66	87,193,883	69,359,620	25.8	67	420,584,253	355,151,259	18.5	57	333,528,905	269,870,536	23.7	88	301,772,412	248,913,893	21.0
	December.	66	99,744,195	80,446,521	24.1	67	447,158,465	373,213,316	20.0	57	363,859,444	293,266,707	24.1	88	311,034,100	249,996,678	24.5
			1916	1915			1916	1915			1916	1915			1916	1915	
	January...	66	97,072,794	77,029,974	26.2	67	431,201,554	356,809,437	20.8	57	362,121,067	284,407,361	27.5	88	301,645,060	258,982,414	16.5
	February..	66	92,855,679	68,982,535	34.8	67	411,715,612	320,924,478	28.1	57	339,326,360	252,816,291	34.1	88	268,653,564	220,662,826	22.1
	March....	66	97,321,924	74,958,898	29.9	67	439,660,902	349,347,454	26.0	57	360,872,072	282,179,673	28.0	88	304,327,753	255,450,143	19.3
	April.....	64	84,769,660	64,816,830	30 8	67	403,223,021	326,574,302	23.4	57	344,866,175	273,367,413	26.4	88	302,386,347	253,778,348	19.2
	May.....	65	84,719,642	64,318,892	31 8	67	409,529,049	333,585,886	22.0	56	345,860,257	275,328,229	25.6	88	328,793,909	266,599,708	23 2
	June.....	65	87,829,797	69,506,884	27 6	67	396,630,887	327,541,507	21.2	56	350,015,166	288,982,024	21.2	88	328,996,553	277,915,476	18.6
	July.....	65	85,317,206	71,160,365	19.8	67	401,179,678	333,771,509	20.3	56	350,708,540	287,407,170	22.2	88	325,647,543	279,285,871	17.4
	August....	65	96,731,211	72,507,205	33.5	67	431,846,967	343,599,649	25.9	56	374,327,105	295,866,692	26.5	88	333,468,777	279,976.391	19.1
	September.	63	93,424,720	70,126,243	33.4	67	435,991,848	359,967,867	21.2	56	387,626,725	307,485,471	26.2	75	255,071,756	208,412,773	22.4

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.
INCOME:										
Group 1.....	8.3	11.1	13.7	16.7	15.1	14.5	16.4	16.8	16.1	16.3
Group 2.....	14.0	18.2	18.4	21.2	18.5	21.7	21.9	18.5	23.1	20.0
Group 3.....	13.1	11.9	14.6	20.5	15.3	17.7	12.0	14.2	15.0	14.0
Group 4.....	15.3	17.4	19.4	17.9	19.5	14.0	15.4	10.0	14.4	9.8
Group 5.....	12.2	16.0	15.8	12.2	15.6	13.0	15.2	13.0	19.4	8.9
OUTPUT:										
Group 1.....	20.1	21.1	30.8	29.2	26.1	25.5	13.1	23.4	28 5	23.9
Group 2.....	25.5	26.4	33.4	25.6	35.6	11.3	31.8	27 4	33.3	27.6
Group 3.....	16.6	20.1	22.0	16.0	13.7	18.0	13.2	11.5	16.0	24.7
Group 4	18.9	15.6	21.8	20.9	19.0	12.6	19.7	16.3	29.5	18.6
Group 5.....	20.6	1.5	24.0	13.1	8.9	35.0	11.1	13.5	20.4	1.3

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.
INCOME:										
Group 1.....	15.8	14.3	18.3	19.3	18.2	18.0	16.4	15.8	16.5	16.6
Group 2.....	9.8	25.5	20.5	19.1	18.0	17.4	17.5	17.3	21.8	21.5
Group 3.....	25.1	24.3	27.0	23 0	26.7	27.2	20.5	18.6	18.4	13.4
Group 4.....	18.3	9.6	20.2	22.9	22.8	24.1	17.5	17.5	10.7	20.0
Group 5.....	18.0	5.7	11.1	14.4	9.4	21.3	12.6	6.1	11.8	11.0
OUTPUT:										
Group 1.....	21.9	24.9	30.8	25.2	24.7	25.0	23.8	21.0	24.3	22.3
Group 2.....	31.0	28.8	44.0	32.3	23.9	19.5	12.3	25.7	36.4	40.0
Group 3.....	41.2	32.5	44.0	40.6	43.5	41.0	31.8	26 0	25.7	20.7
Group 4.....	18.5	53.4	41.0	31.9	39.2	38.5	34.3	21.1	23.0	33.8
Group 5.....	20.6	13.3	15.9	19.1	10.1	14.7	4.0	8.6	6.1	13.7

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.
INCOME:										
Group 1.....	6.0	11.6	6.7	8.5	3.9	7.2	7.5	4.7	5.5	8.2
Group 2.....	17.3	†	†	18.7	3.5*	2.3	1.2	0.6*	0.7	4.9
Group 3.....	24.6	19.7	22.0	28.1	40.0	39.0	39.5	28.3	32.5	28.5
Group 4.....	10.8	3.0	8.2	17.5	11.7	13.8	3.6	1.0	0.5	11.5
Group 5.....	3.9	10.5	17.8	26.3	12.0	19.1	12.8	13.2	13.0	11.7
OUTPUT:										
Group 1.....	13.1	9.1	13.0	22.7	8.0	12.0	8.0	10.0	6.3	9.7
Group 2.....	56.0	†	†	28.3	3.6*	2.2	1.0	2.0	6.5	7.8
Group 3.....	67.0	56.0	68.8	39.0	80.0	79.0	74.5	56.1	57.5	60.0
Group 4.....	10.5	1.8	13.8	18.6	10.3	21.8	10.0	4.0	7.5	12.0
Group 5.....	1.0	1.0	20.1	30.0	11.7	17.5	16.0	10.8	16.5	7.0

*Decrease. †Results omitted owing to insufficient returns.

1916 shows a probable output in excess of 22,000,000,000 kw.-hr.

With the exception of the Atlantic States the rate of increase in comparison with September, 1915, was greater during last September than during the immediately preceding months. In the Atlantic States the rate of growth was slightly less than during the previous months. Particular evidence of better conditions is noted in the returns from the Far West. During July and August results of operation from this section did not appear to as good an advantage when compared with corresponding months of 1915 as did the results from the earlier months in the year.

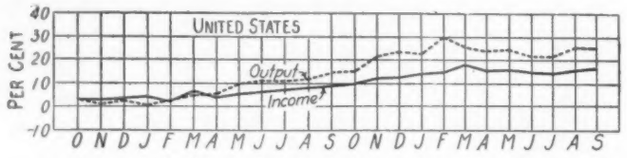
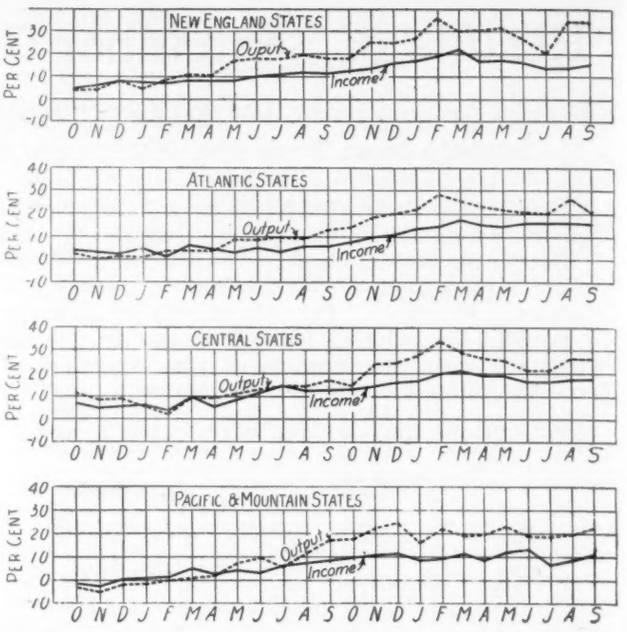


FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

Much of the growth this year in the Far West can be attributed to the tremendous activity in the shipyards, where a very large tonnage is being prepared for Pacific service, and to mining operations, which never before have been so active as during the present year.

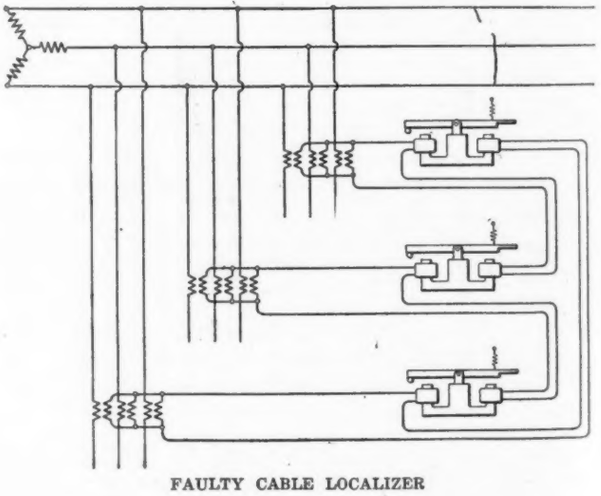
The accompanying curves show graphically the percentages of increase both in income and output as contained in Tables I and II. The remaining tables show the percentages of increase in income and output for companies grouped according to size. Those contained in group 1 operate in cities having a population of over 100,000 inhabitants. Those in group 2 operate in cities the population of which is between 50,000 and 100,000; group 3 in cities of a population between 25,000 and 50,000; group 4 between 10,000 and 25,000, and group 5 between 5000 and 10,000.



FIGS. 2 TO 5—CENTRAL STATES INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

Fault Localizer for Polyphase Transmission

In order to determine upon which feeder or cable of a polyphase system a fault occurs, Archibald Davis of Schenectady in patent No. 1,203,556, suggests a system of two-coil relays operated by the out-of-balance



FAULTY CABLE LOCALIZER

current component. The relays consist of coils balanced against each other, the only relay of a set of three operating being the one in which an unbalancing occurs. When, therefore, an unbalancing occurs due to a ground the relay corresponding to the feeder is operated.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Distribution and Maintenance Costs of Serving Consumers

The following distribution and service expenses are shown in a recent analysis by the Pacific Power & Light Company. The average distribution cost per consumer for the year ended Aug. 31, 1916, was $1.83. Lower costs ($1.53 up) existed in some districts, but expenses ran as high as $4.05 in other districts. Setting and removing meters and transformers on the average cost $0.55 per consumer, the minimum expense being $0.29 and the maximum $0.99. Meter maintenance averaged about 8.14 cents per meter, although in some districts the expense went as high as 13 cents and as low as 4.8 cents. Maintenance of installations varied from 5 to 88 cents and averaged about 19.9 cents. The commercial expense per consumer had a range of $2.60 to $6.40 and averaged $3.48. It should be pointed out that all items making up the total expense of serving consumers are not included.

Jib Crane for Hoisting Pole-Top Transformers

BY N. M. LONGBOTHUM

Facilities for hoisting transformers are being provided on many of the Connecticut Power Company's transformer towers so that time will not be wasted when making changes or additions to the transformer equipment which are frequently required due to changes in load. One arrangement employed in the vicinity of

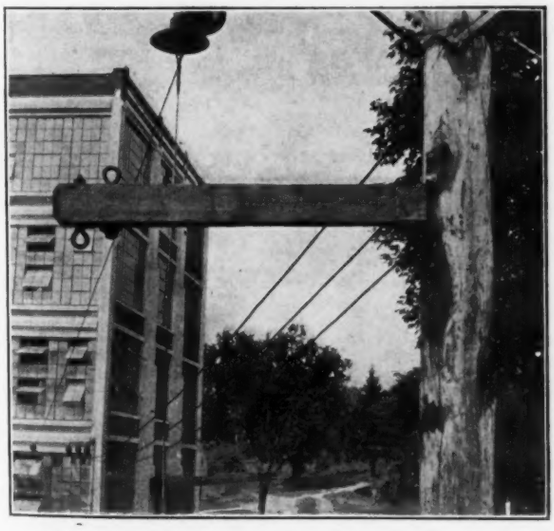


FIG. 1—BOOM HINGED TO POLE FOR SUPPORTING TACKLE

Thomaston, Conn., is shown in Fig. 1. This involves the use of a jib crane hinged to the pole and supported at the opposite end by a tackle attached to the top of the pole. The hinge consists of two 0.5-in. by 4-in. by 8-in. iron straps bent into L's and bolted through the pole in such a manner that a 4-in. by 6-in. timber boom can be placed between the projecting portions of the L's and hinged thereto by a kingbolt.

Dressed yellow pine is used for the boom, the hinged end being wrapped with a strip of ⅛-in. sheet steel, which is fastened in place so that the kingbolt will not split the timber. Two different lengths (6 ft. and 10 ft.) of booms are used depending on the position to which the transformer must be transferred. At the outer end of each boom are two ⅞-in. eyebolts, one to

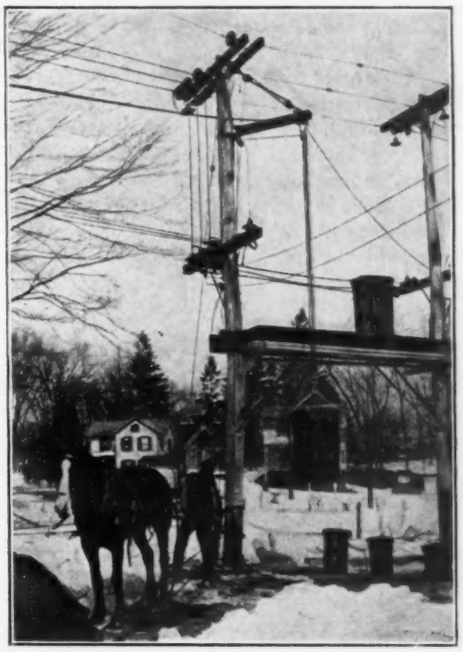


FIG. 2—HOISTING TRANSFORMER TO ELEVATED PLATFORM

receive the hoisting tackle and the other for attaching the boom guy. The method of using one of the jib cranes is illustrated in Fig. 2. While the crane may be left installed permanently the design permits of carrying the booms on construction trucks and installing them only when required.

Motor Flywheels Used in Cooperage Works to Eliminate Momentary Peaks

Machines in use in the plant of the Western Cooperage Company of St. Johns, Oregon, have a cycle of operation from practically no load to a very considerable overload. To properly adapt individual motor drives to this condition of service a thorough study was made of the characteristics of the operating cycles, with the result that it was decided to use flywheels to eliminate the large momentary fluctuations in power demand. The application of a flywheel to these machines has worked out well, has held the fluctuation to within an allowable limit, and has kept the motor speed practically constant, which is a factor of considerable importance in the work handled. Cast-steel flywheels approximately 1500 lb. in weight are used on eight of the 75-hp., 900 r.p.m. motors which drive bolters, the motors being directly connected to the bolter saws.

Losses in Delivery of Energy from the Coal Pile to Customer

That over-all efficiency in the delivery of energy from the coal pile to the customers' meters can be maintained at a high figure in a well-designed and managed station is clearly shown by data compiled by H. A. Snow of the Detroit Edison Company. In 1910 the customers received 5.9 per cent of the energy in the coal, while in 1915 11.2 per cent was delivered, an increase of 90 per cent. This company at present is burning more than 1400 tons of coal a day, not including the coal that is used in the steam heating plants. A little less than 82 per cent of the energy available from this coal survives the boiler room and appears in the live steam which is fed to the turbines, where the greatest loss takes place. In the conversion from heat energy in the steam to mechanical energy, and then to electrical energy in the turbines and generators, all of the energy except 13.6 per cent disappears. Of this 13.6 per cent which is left, about 12.4 per cent finally reaches the customer after passing through the electric transmission, conversion and distribution apparatus. Of the 88.6 per cent of the available energy which is lost, more than two-thirds goes to the Detroit River in the circulating waters of the main condensers and the rest goes up the stacks.

The following figures show the per cent of energy generated that reached the customers:

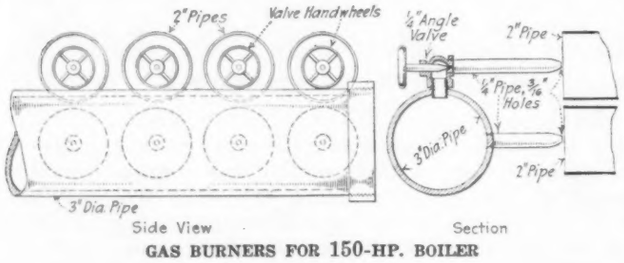
Month		Per Cent	Month		Per Cent
October,	1915	76.3	April,	1916	85.5
November,	1915	82.3	May,	1916	83.7
December,	1915	83.2	June,	1916	85.3
January,	1916	83.6	July,	1916	82.8
February,	1916	86.0	August,	1916	81.0
March,	1916	81.4	September,	1916	81.7

Slight variations from month to month are due to unavoidable errors in the method of calculation, caused by the reading dates of customers' meters extending over the entire month, while the output covers the period of a calendar month.

Arrangements of Gas Burners Under Power Plant Boilers

BY T. W. REYNOLDS

The accompanying drawing shows an arrangement of oil burners that has proved satisfactory in a Canadian plant for burning gas under boilers. The nearest point to the boiler shell from grate level in the setting was 4 ft., and these burners are placed 2 ft. above grate level and above fire doors, so as to be out of the way when



GAS BURNERS FOR 150-HP. BOILER

it is necessary to change over to coal, which happens quite frequently. The arrangement permits this to be done without a drop in the steam pressure. For an installation consisting of boilers 6 ft. by 18 ft. in size, rated at 150 hp., burners with thirty nozzles were used, eighteen nozzles without valves and twelve with 0.25-in. valves for regulation purposes. The 2-in. pipes were built into the brickwork, as shown in the drawing.

In case there is not enough room in which to place the burners above the fire doors, on account of an old type of setting, where it would not be necessary to change to some other kind of fuel, the 2-in. pipes could be bricked in the fire doors or, better still, other doors could be cast and cored for the sufficient number of air tubes, and these holes tapped and the air tubes screwed in.

It will be noted that the 0.25-in. nozzles are reduced to 3/16 in. at the outlet. This is important and gives the best mixture for a 2-in. tube and a gas pressure of 7 oz.

Safety Precautions When Conducting High-Potential Tests

When conducting high-potential tests on cable, insulators, and other forms of apparatus, reliance is usually placed in the ability of the man doing the testing to warn helpers, witnesses, and inspectors when they approach too closely to the apparatus being tested. Often the man who is in charge of the work is busy regulating the voltage or reading instruments, so that he is unattentive of the safety of others. To eliminate this condition many ingenious schemes have been worked up to make high-potential testing safe to all who are connected with the work. The most elementary form of protection is the use of danger signs mounted on standards and equipped with red lights. These standards are portable, and may be arranged to guard the apparatus being tested. Enlarging on this plan it was found feasible to place the apparatus to be tested in a wire cage and equip the entrance with a form of circuit-closing lock. The low-voltage leads to the transformer pass through these locks on the gates, so that anyone attempting to enter the cage during a test will open the circuit and stop the test. The use of red lights about the cage and on the switchboard which light when the voltage is being applied are useful as warning signals.

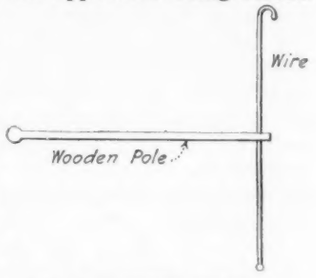


FIG. 1 — SHORT-CIRCUITING STICK

It is the practice in testing small wires covered with rubber insulation to immerse the coils in tanks filled with water and connect the ends together with bare tinned copper wire of a small gage and then run these small leads to the testing transformer bus. These leads are fine, and when the wires are tinned it is difficult to see them against a light colored wall, hence accidents are liable to take place from observers walking into the test leads. To eliminate this danger the tinned leads may be wound spirally around a white center of thick cord. This cord can easily be seen from across a room.

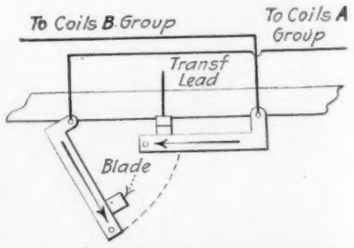


FIG. 2—SPECIAL SWITCH FOR SPLIT-TRANSFORMER BUS

In testing wires and cables precautions must be taken against laborers touching the test leads before the voltage is off. There are instances on record where an oil switch has stuck leaving potential on the wires when other indications showed the coils to be dead. To do away with this condition a piece of heavy wire

may be mounted at the end of a long pole so that the man who changes the leads from one coil to another must touch the testing lead with one end of the wire and immerse the other end in the water. In this way if any potential is on the test leads, it will be short-circuited through the wire to the water or ground throwing out the breaker and warning the man before he can touch the leads with his hands.

In some cases the test bus is split, allowing potential to be applied at either end of the testing cage or in two different cages. To eliminate the chance of the tester getting potential on both circuits at once, or upon the wrong half, a special switch equipped with an arrow to show the direction may be provided. This switch may be also arranged to be interlocking and prohibit the application on both buses at the same time.

These are but a few examples of methods in vogue to promote safety in plants where high-potential makes the occupations more or less dangerous.

Service from Street Lighting Cable Buried in the Earth

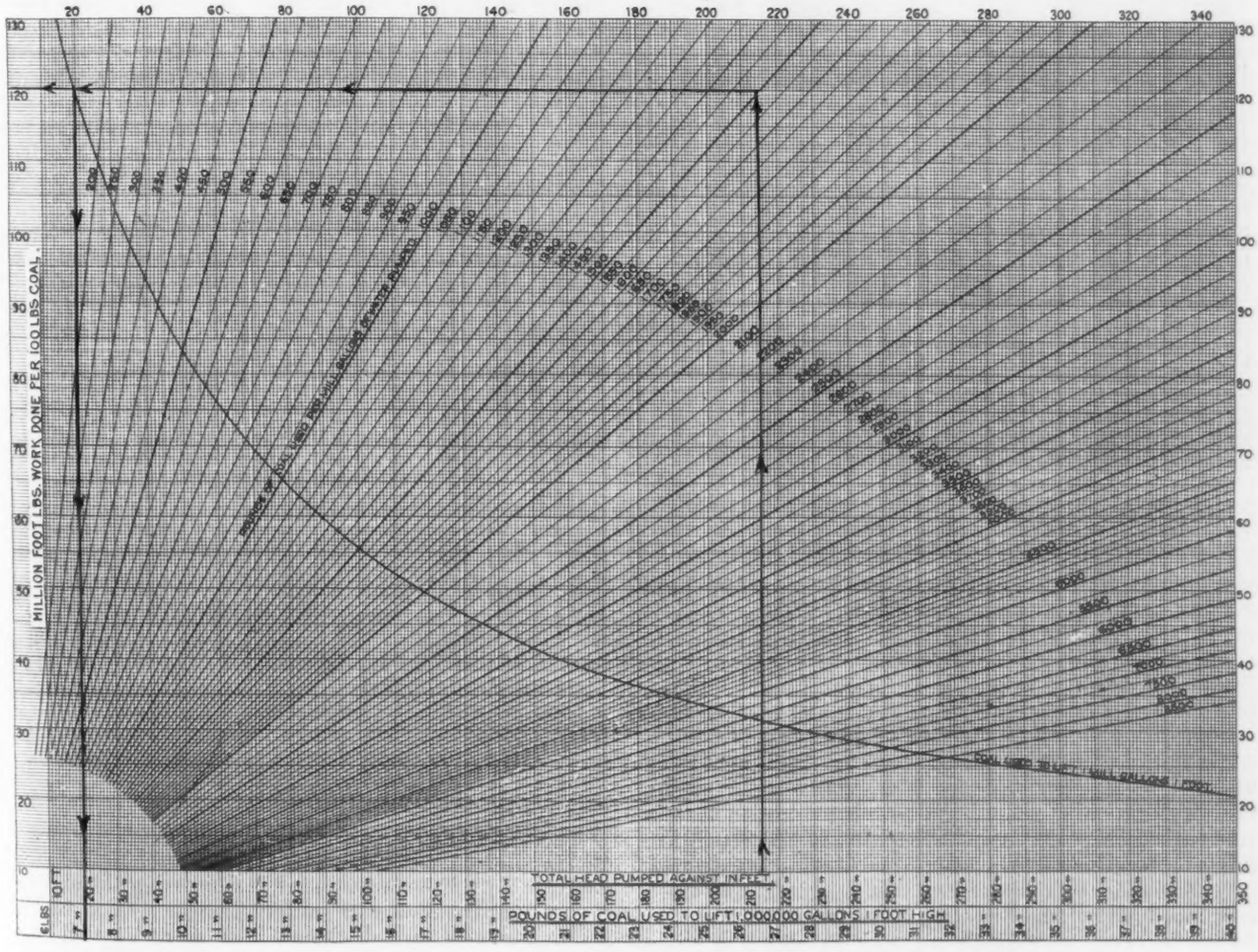
According to H. F. Winte, the Detroit Edison Company has about 19 miles of single-conductor cable (mostly No. 6, with some No. 8 and No. 10) buried in the ground that has served ornamental street lighting circuits satisfactorily for a considerable period. These circuits are operated at 7.5, 6.6 and 5.5 amp. (approximately 11 miles operating at 7.5 amp.). Some of this cable has been in service about nine years, and very little trouble has been experienced with the cable itself. About 10 miles additional of such cable is now being installed by this company in several suburban towns.

Coal Consumption Required for Certain Pump Duty

When it is desired to determine the duty developed by a plunger pump per 100 lb. of coal, and the coal consumption required to lift 1,000,000 gal. of water 1 ft., the accompanying chart may be used with approximate results. It may be pointed out, however, that boiler and engine efficiencies are included so that the accuracy of the results will depend on the equipment used.

To explain the use of the chart, assume that 4,312,000 gal. of water were pumped in a day against a 215-ft. head with a coal consumption of 6470. This corresponds to 1500 lb. of coal per 1,000,000 gal. Therefore, follow the vertical line marked with the head (215) until it intersects the diagonal line representing the pounds of coal (1500), and then trace the horizontal line to the side of the chart and find the duty 120,000,000 ft.-lb. per 100 lb. of coal.

Providing it is desirable to find the coal consumption required to lift 1,000,000 gal. 1 ft., find the intersection of the horizontal line representing the duty (120,000,000) with the curved line, and from this intersection follow the vertical line to the bottom scale, where the coal consumption per 1,000,000 gal. (7 lb.) will be found. This chart was prepared by the engineering department of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.


MILLION FOOT LBS. WORK DONE PER 100 LBS. COAL
TOTAL HEAD PUMPED AGAINST IN FEET
POUNDS OF COAL USED TO LIFT 1,000,000 GALLONS 1 FOOT HIGH

1—CHART FOR COMPUTING COAL CONSUMPTION REQUIRED TO OPERATE PUMPS

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

Color Effects and Indirect Lighting in a Los Angeles Restaurant

BY F. S. MILLS AND J. A. HOEVELER

An extremely novel and striking illumination scheme has been worked out in the supper room of the new Alexandria Hotel, Los Angeles, Cal., which while giving brilliant color effects in the ceiling decorations combines the colored light from indirect sources in such a way that the resulting general room lighting can be made of normal "white" color or of any mixture of the primary hues.

The principal lighting units are carried in indirect fixtures, which were selected as permitting a more complete mixture of the several colors than would have been possible with the same number of direct units. By the use of the indirect method the primary colored light sources remain concealed and the light from each is spread out over the ceiling in such a manner as to cause a complete mixing of the three colors.

THE INDIRECT CEILING UNITS WHICH PROJECT BRILLIANT COLORS ON THE OVERHEAD DECORATIONS COMBINE TO PRODUCE A "WHITE-LIGHT" GENERAL ILLUMINATION THROUGHOUT THE LOWER PART OF THE SUPPER ROOM

Each of the eight indirect fixtures contains six gas-filled tungsten lamps of 200-watt size, and each lamp is equipped with an individual silvered-glass reflector. Over these units are placed wire frames supporting two red, two green and two blue gelatin films, giving the three primary colors. Dimmers are placed in circuit with each group of colored lights, in order that the intensity of the various colors may be varied at will. In addition to this equipment, a single large gas-filled lamp and individual silvered-glass reflector was installed in order to provide ordinary illumination when the colored lighting is not in use. All of this equipment is housed in ornamental beaded fixtures. The fixtures are constructed of wire frames supported from the four vertical rod hangers shown in the picture. From the different radii of the wire frames blue and white beads are draped. Provision is made to allow sufficient reflected flux from the ceiling to filter downward and illuminate the beads.

The room is 90 ft. long by 38 ft. wide, and is divided by four beams. The side walls and ceiling are decorated with a special cloth arranged to panel the side wall and run upward to a bull ring in the center of each panel of the ceiling. The cloth is of alternate white and green stripes. Over the cloth across the ceiling and partly down each wall are placed a fern cloth and fern branches covered with ground mica. This gives the effect of trees overhanging the room and covered with snow. From the ceiling are hung thousands of different size balls, 4 to 7 in. in diameter, suspended on fine wires. These balls are also covered with ground mica, which gives them the appearance of snowballs.

The balls suspended from the ceiling intercept the primary colors from the lighting units and so appear red, green and blue on their various sides. The diffusion of the light eliminates any pronounced shadow of the balls on the ceiling, where a perfect mixing of the primary colors takes place, and the ceiling illumination takes on a hue which is dependent on the proportions of the three primary colors employed. Thus the "snowballs" may at any time appear red, green and blue in varying degrees of saturation and brightness, while the illumination of the ceiling and interior may be of some other color of the spectrum. As the lighting effects are changed by manipulation of the rheostats, the color sensations of the snowballs change, always exhibiting the component colors and differing from the color of the ceiling, except when only one primary color is used, as, for instance, the blue for moonlight effect. In the words of the archiect, Edwin Bergstrom, "The lighting of this room may be carried through all the color sensations of sunrise to sunset and into the evening shades. It is a wonderful reproduction of the color sensations of the 'Land of the Midnight Sun.'"

Personnel an Important Factor in Relations with Public

"I am of the opinion that the destinies of our public utilities lie in our own hands," said Arthur Williams of the New York Edison Company in discussing the subject of "municipal ownership" before the convention of the Southeastern Section of the N. E. L. A. at Tampa, Fla., Nov. 15. "We must be a unit for good service at fair

prices; we must do everything in our power to win the esteem and friendship of the public—these being values of the greatest importance. We must be frank with the public and utilize for this purpose the usual agencies of communicating with the public.

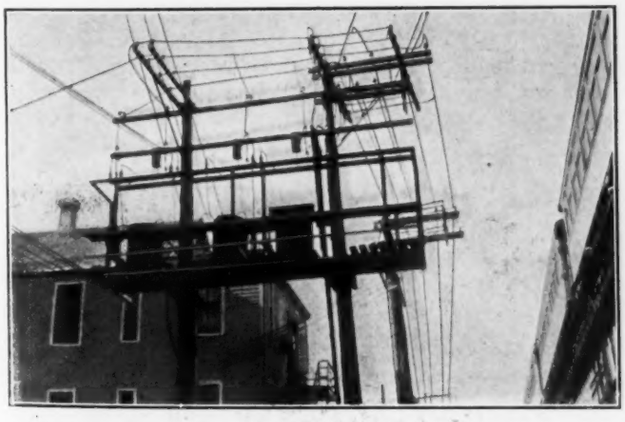
"The newspaper men of the country I believe are efficient and honest. Treated with fairness, they will treat us with fairness. They may give undue prominence to the public as opposed to the corporation; they may even favor the agitator; but it is the exception, not the rule, where they will not permit us, in one way or another, to state fully our side on any public question. The public is entitled to be informed and if not informed it will probably be prejudiced.

"Your personnel, which after all is but a part of the public, should be maintained in the highest state of efficiency. Here general as well as technical education is of the greatest importance. It need not be a college education—this should be understood; but that kind of an education which enables one man to meet another competently and politely and at the end to leave, each with some degree of regard for the other. Before the public you are the trustees of your ability to serve the public."

ELECTRICITY INCREASES DOLL FACTORY OUTPUT

Electric Baking Ovens and Motor-Driven Machines Reduce Operating Costs of Chicago Doll Manufacturer

The Pullman Doll Company of Chicago, which until recently was producing plaster composition doll heads and sawdust stuffed doll bodies in a small plant, has moved into a larger factory which is electrically operated throughout. In laying out the new installation an effort was made to install machines which would reduce the amount of hand labor and would increase the rapidity of plant production. Since the doll-making industry is one comparatively new to this country, the Europeans having produced most of such



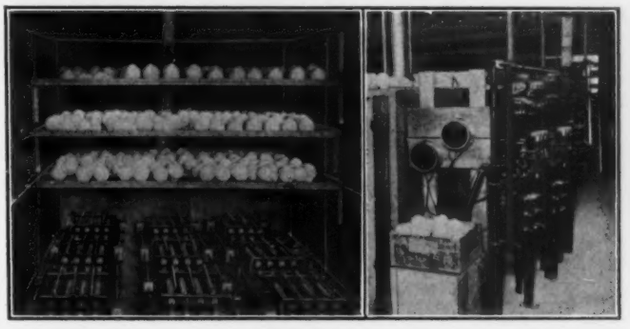
THREE 40-KW. TRANSFORMERS WHICH SUPPLY CENTRAL-STATION SERVICE FOR THE PULLMAN DOLL FACTORY

goods in the past, the solution of the problems was in some respects original.

In manufacturing the doll heads a quick-setting plaster composition, the formula of which is secret, is first cast by hand in a split mold. When the heads are removed from these molds and the seams and rough places have been smoothed with sandpaper, they weigh about 6 oz. each. They are then loaded on racks and placed in a 49.2-kw. electric oven for a forty-five-minute bake. During this period the oven temperature, controlled by means of Taylor automatic mercury-operated thermostats, is maintained at 300 deg. Fahr. At the end of that time 2 oz. of moisture is evaporated from each head. From an average bake, which is 650 heads, about 8 gal. of water is removed. To accomplish this drying process without the electric heat formerly required from three to four days. Furthermore, the old air-drying process was uncertain and often resulted in weak castings.

HEADS DRIED QUICKLY IN ELECTRIC OVEN

When this first bake is finished the doors are partly opened and the oven is allowed to operate for fifteen minutes in this manner while the heads cool. Quick



DETAILS OF HEATING ELEMENTS IN ELECTRIC OVEN, AND THE TEMPERATURE-CONTROL APPARATUS FOR THE THREE OVENS. THESE OVENS DRY OUT THE MOISTURE FROM THE COMPOSITION DOLL HEADS, AND LATER DRY THE ENAMEL ON THE FACES

chilling would crack the composition. Then the heads are given a coat of glue sizing, which dries in three or four minutes and permits the first coat of enamel to be applied. On an air-dried head it takes about two days for glue sizing to dry because of the moisture in the casting, but with the electric process the first coat of enamel can be applied almost at once, and the heads can be taken to a second oven containing heaters rated at 39.6 kw. Here they are again baked for forty-five minutes, but at a temperature of 200 deg. Fahr. They are then removed from oven No. 2, given another coat of enamel and placed in oven No. 3, where heaters rated at 24.6 kw. maintain a temperature of 150 deg. Fahr. for forty-five minutes. The uniform forty-five-minute interval has been selected for all ovens to keep the heads moving in uniform routine. It was difficult to make the plaster handlers believe that complete drying could be accomplished in this short interval. But after much educational effort had been expended and several tests had been conducted, they have become firm adherents of the electric drying process. These ovens when loaded full at each bake can turn out 10,000 doll heads a day. The factory production will now average about 8000 per day.

ELECTRICITY PLAYS PART IN OTHER PROCESSES

From the ovens the heads are taken to a hand-finishing department, where girls operating air brushes spray colors on the castings to imitate hair and cheeks. The lips and eyes are painted in by hand. Electricity is used in the spraying process to supply air pressure and to drive the exhaust fan which removes the paint vapor from the room.

The cloth for the bodies of the dolls comes to the factory in bales. Guided by a pattern laid off on the top of a pile of cloth 6 in. high, an operator cuts literally thousands of pairs of legs, arms and bodies at one time by means of a motor-driven knife similar to those

sometimes used in the garment trades. The parts are then sewed into closed shapes for the arms, legs and bodies on a battery of twenty-six Standard motor-driven sewing machines which operate at the rate of 4000 stitches per minute. A 3-hp. motor drives the entire group of machines.

Electrically Driven Sawdust-Packing Machine Speeds Up the Production of Arms and Legs

The cloth parts are then ready to go to the special sawdust-ramming machine. Sawdust is fed into hoppers at the top of this unique piece of equipment. When the operator has placed one of the little cloth sacks, fashioned perhaps to simulate an arm, over the spindle beneath the hopper, he operates a foot treadle, which sets in rotation an augur-shaped tool inside the spindle. This feeds the sawdust into the cloth arm. At the same time a cam moves the rotating augur rapidly up and down so that it tamps the sawdust into the cloth as it feeds it. This machine is driven by a 7.5-hp. motor, and is operated by a small force of boys, yet the output from it amounts to more than 8000 dolls per day. In the German doll factories all sawdust packing is carried on by hand, and a very large crew would be required to establish such an output. The assembly of the cloth and sawdust parts is accomplished by a wire-stitching, manually-operated press.

ELECTRICALLY-OPERATED EQUIPMENT OF PULLMAN DOLL COMPANY

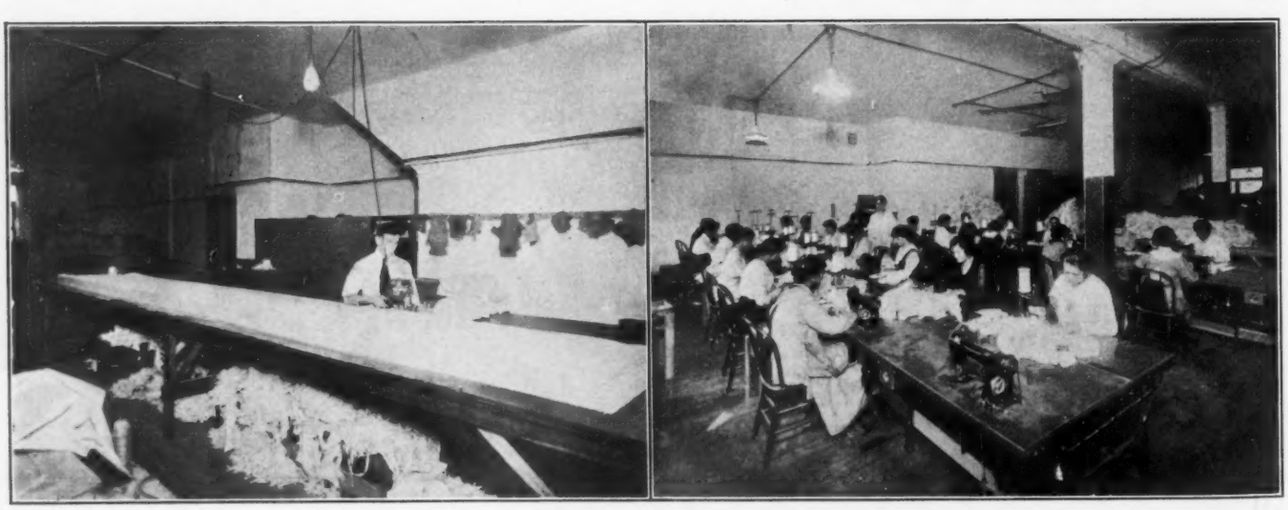
Apparatus	Nature and Rating of Electrical Equipment	Make
Oven No. 1	Twelve, 4100-watt heaters	General Electric
Oven No. 2	Nine, 4100-watt heaters	General Electric
Oven No. 3	Six, 4100-watt heaters	General Electric
Temporary portable heaters	Totaling 35 kw.	Hughes & Simplex
Compressor for two air brushes	Motor, 3 hp. 110-220-volt, Type 11-T	Wagner
Exhaust fan, air brush department	Motor, 1 hp. 220-volt, Type I M	Westinghouse
Water pump in molding room	Motor, 1 hp. 220 volt	General Electric
Twenty-six sewing machines	Motor, 3 hp. 220-volt	Rice
Ten-spindle stuffing machines	Motor, 7.5 hp. 220 v lt	Western Electric
Seven-spindle stuffing machines	Motor, 5 hp. 220-volt	Western Electric
Universal cloth cutter	Motor, 0.5 hp. 110-volt	
Exhaust fan for ovens	Motor, 1.8 hp. 110-volt	
Lighting	Eight 500-watt electric irons	General Electric Princess
	Twenty-one factory fixtures	
	Seventeen drop cords	

Aside from this cycle of manufacturing operations there is much of interest in the electrical equipment and the ovens. Energy taken from the 3800-volt, three-phase, 60-cycle primary line is reduced to a potential of 230 volts in a bank of three 40-kw. transformers, and is carried a distance of 75 ft. over three 500,000-circ. mil cables to the oven panels. The three ovens, Nos. 1, 2 and 3, each of which measures 10 ft. by 6 ft. by 5 ft., are equipped with twelve, nine and six 4100-watt heaters respectively. All units are mounted on the floor in standard General Electric fittings, and are supplied with energy through steel busbars. Doors have been placed at both ends of the ovens to facilitate quick loading and unloading. Except at the edges of these doors no metal passes through the oven walls. The heat insulation consists of 1800 lb. of mineral wool, 600 lb. of nonpareil high-pressure cement. The walls 200 sq. ft. of 2-in. nonpareil high-pressure block and are 3 in. thick and the top and bottom are 2 in. thick. The oven installation complete weighs 3 tons. To provide ventilation to carry off the moisture twelve holes 2 in. in diameter are placed at the bottom and ends of each oven. The holes can be closed by means of dampers. At the top of each oven two 6-in. exhaust stacks are installed. These are connected to a header in which a $\frac{1}{8}$-hp. Ilg blower has been placed to insure adequate draft.

Cost of Installing and Operating Electric-Heating Equipment

The approximate cost of the complete installation was $4,000. That this figure is no higher is due to the efforts of the heating engineers of the Commonwealth Edison Company. A. F. Allsop, the heating engineer for that company, designed the electric ovens and arranged to have them built by a Chicago concern, which took the work at a price amounting to only one-third of that asked in the bids offered by large oven companies.

During the first few months this plant has been in operation electric service has been taken on a limited-hour contract and the maximum demand has been about 100 kw. A part of this demand is attributable to an installation of 35 kw. of portable heaters used in making very cheap doll heads. The data thus far obtained indicate, however, that the power cost in this factory will be about 4 per cent of the total cost of production. The average rate earned will be about 2 cents per kilowatt-hour. The owner of the factory, Mr. Pullman, has confidence that with this new equipment he will, when war conditions permit, make dolls at a price which will allow him to ship them even to Europe and to compete in price with European products.



ELECTRICALLY-OPERATED KNIFE WHICH CUTS THROUGH 6 IN. OF CLOTH AT ONE TIME, TURNING OUT DOLL LEGS, BODIES AND DRESSES, WHICH ARE LATER SEWN BY THE GIRLS AT THE GROUP MACHINES PICTURED AT THE RIGHT. THESE MACHINES SEW 4000 STITCHES PER MINUTE. PHOTOGRAPHS BY COMMONWEALTH EDISON COMPANY

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

PROTECTION AGAINST SURGES

Report of a Special Joint Committee of the Swiss Electrical Society and the Association of Swiss Electricity Works

IN Bulletin No. 6, 1916, of the Schweizer Elektrotechnische Verein (Swiss Electrical Society) is published the report of a special committee appointed by this society jointly with the Association of Swiss Electricity Works to study the protection of electrical installations against surges. An English translation of this report in abstract was published in the London *Electrician* Oct. 27, 1916.

The report points out the necessity of distinguishing dangerous rises of voltage of longer duration from veritable surges, which are of a transitory nature, the rise of voltage produced being of a very short duration, in the case of alternating-current circuits only a small fraction of a period of the supply frequency. These surges are generated by sudden disturbances of the equilibrium of the circuit, and may be (*a*) of internal origin caused by switching operations, short-circuits, earths or sudden changes of load, or (*b*) of external origin, caused particularly by transitory atmospheric phenomena. Surges of this kind may be best described by the conception of traveling waves and wave reflection as follows:

(1) Surges of internal origin arise from sudden increase or decrease of the electromagnetic field of the circuits. They are accompanied by the simultaneous appearance of a charging wave and a discharging wave starting from the point where the disturbance was produced and traveling in opposite directions along the line according to the laws of free oscillations. These waves have a very steep wave front, *i.e.*, very large potential differences may exist between points on the line that are close to each other. The magnitude of the rise of voltage depends on the line voltage and cannot exceed twice the line voltage unless there is an occurrence of resonance phenomena.

(2) Surges of external origin arise from time and space variations in the potential difference existing in the terrestrial electric field. The charging waves have the character of traveling waves, and are superposed upon the electric state of the supply system, traveling according to the laws of the free oscillation of the system composed of the supply system and earth. The magnitude of the rise in voltage produced and the energy of the wave motion depend solely on the character of the electric field and the position of the supply system in that field, and are independent of the supply voltage, and the rise of voltage may reach several times the value of the supply voltage.

"Primary voltage rises" arise directly from the disturbance of the original state of equilibrium of the energy in a line. These voltage rises may cause the appearance of "secondary voltage rises," the amplitude of which is greater than that of the primary rise through reflection or the excitation of local oscillating circuits.

The best practical protection against surges consists in taking the steps necessary to hinder the production of initial disturbances, and the installation of protective devices is only justifiable where this means has been found to fail. It is impossible to prevent absolutely external disturbances, mainly of atmospheric origin; there is no means of preventing the destructive effects to lines actually struck by lightning. The essential problem is to prevent surges from leaving aerial lines and reaching the apparatus or machines fed by them. This may be carried out by placing at the ends of the lines apparatus capable of reflecting the surges back on to the line or of dissipating the surge energy by transforming it into heat, by radiation, or by discharges at the insulators.

All devices with a valve action, such as spark gaps, horn lightning conductors, or Giles valves, are suitable as a protection against surges that are dangerous on account of their amplitude. These devices are provided with damping resistances for a twofold object: firstly, to produce a damping effect by transforming the surge energy into heat without reflection, and, secondly, to limit the magnitude of the current in the arc so as to prevent the affected circuit from being automatically cut off. The use of this type of apparatus is limited in modern installations by the following considerations:

(*a*) In high-tension systems (above 12,000 volts), the limitation of the arc current necessitates resistance of such a value that only a small portion of the surge energy can be transformed into heat in them. If a reactive coil is used the greater part of this energy is reflected into the line.

(*b*) Spark gaps, particularly if they are used in combination with reactances, may give rise to secondary surges. But as these conditions are not frequent in practice, the use of this class of apparatus is not greatly limited by this fact.

(*c*) Surges with steep wave fronts do not suffer any flattening of their front if spark gaps are used (unless damping resistances are present). On the other hand, choke coils placed in the leads to the plant that is to be protected have a flattening effect on the wave front.

The insertion of a concentrated inductance between the aerial line and the apparatus to be protected or the connection of a condenser in parallel with the line at the same point has the effect of diverting surges from the apparatus to be protected and to flatten out their wave front without the formation of a spark discharge. If suitably designed these devices produce a less harmful form of wave. Combinations of choke coils and condensers act in this manner, but more effectively. This mode of protection is independent of the supply voltage; it depends only on the character of the plant to be protected and of the protective devices themselves. The following circumstances tend to limit the effectiveness of such combinations of choke coils and condensers:

(*a*) An appreciable reduction of the value of the rise of voltage is only obtainable with this class of apparatus if the distance over which the surge is distributed does not exceed a definite value that depends on the constants of the apparatus to be protected and of the protective devices themselves.

(*b*) Choke coils and condensers constitute points of reflection; their protective effect concerns only the transmitted wave and not the reflected wave, which is thrown back with increased voltage by the choke coils.

This circumstance is not of great importance in respect of waves reflected back on to aerial lines.

(*c*) Choke coils and condensers absorb the energy of the surge only momentarily without any appreciable transformation into heat; there is no actual dissipation of the surge energy.

(*d*) Combinations of choke coils and condensers may constitute local oscillating circuits when acted on by periodic waves, and thus give rise to large resonance voltages. It is found that this is of rare occurrence, and so the use of this combination is hardly limited by this fact.

The drawbacks just referred to may be avoided by shunting the choke coils with resistance and by inserting resistance in series with the condensers (Campos system).

The flattening of steep wave fronts and the protective effect indicated before may be assisted to any extent by connecting several choke coils in series at not too small intervals.

Waves that have been rendered harmless by some protective device may again assume a dangerous character after reaching the apparatus to be protected if they are reflected by inductances, such as current transformers, magnet coils of circuit breakers, etc., forming an integral part of such apparatus. The shunting of these inductances by spark gaps or by resistances weaken such reflections to the extent of rendering them harmless.

The secondary surges produced by primary disturbances may be completely avoided if the free energy is entirely dissipated in the protective devices. This is of importance in the case of systems of cables.

This is the gist of that section of the report which covers the fundamental principles of protection against surges. The final part of the report gives practical advice as to how to apply these protective principles. Reference to this part of the report will be made in a future issue.

Generators, Motors and Transformers

End Rings.—R. ROBERTS.—Following upon the work of R. Livingstone, who first attacked this problem which occurs a great deal in electrical machinery, the author attempts by proofs of similarity to find a method for calculating deflections and stresses in end rings of all sections. By means of curves and an extreme example he shows how simplified formulas may be used without grave error.—London *Electrician,* Nov. 3, 1916.

War Construction of Machines in Germany.—W. WECHMANN.—An article on the use of substitutes for copper, such as soft steel and zinc, in the construction of dynamo electric machinery and electric installations in general.—*Verein Deutscher Machinen Ingenieure,* Feb. 15, 1916; *La Lumiere Elec.,* Nov. 11, 1916.

Installations, Systems and Appliances

Combined Electricity and Gas Works.—J. W. NAPIER.—A long abstract of a paper read before the North British Association of Gas Managers, together with some editorial comment. The paper deals with the question of whether gas authorities should also run electricity works and gives a description of what has been done at Alloa. Some years ago the undertaking at Alloa purchased energy in bulk at rates which appear to have given no chance of the development of a power load. The Council then decided to erect an electrical plant at the gas works, power being obtained from gas engines using producer gas, and the producers being supplied with coke from the gas works. The gas and electricity stations are under the same management. The result of the new policy has been a rapid extension of the power load; in 1916 the total number of kilowatt-hours sold amounted to 780,963, as compared with 178,667 in 1912. The total working costs amount to 1.8 cents per kilowatt-hour sold, and this is a low figure for a comparatively small undertaking. Comparison with undertakings of a similar size operating with steam plants shows at once that the fuel cost of 0.46 cent per unit is where the chief gain is to be found, though in the management also, which stands at 0.1 cent, there is considerable saving. On the other hand, the cost of oil, water, waste, and stores amounts to 0.22 cent, and is more than double the figure which is usually found. Wages are somewhat on the high side, but repairs and maintenance are rather lower than usual, and have probably not yet reached a stationary figure. So far, non-recovery plant has been used, but in the extensions, which are now contemplated, it is the intention to include a Mond plant, and in that event the cost of fuel should be still lower. In the case of small undertakings there seems to be a great deal to be said in favor of combined undertakings of this kind, as the cost of production can be reduced and the outside staff can be employed in dealing with both electricity and gas. On the other hand, if an undertaking reaches any considerable size, it is probably better that the conflicting interests should be quite separate, for the greatest progress is generally made where there is keen competition.—London *Electrician,* Oct. 20, 1916.

Electrochemistry and Batteries

Tank Resistance in Electrolytic Copper Refineries.—LAWRENCE ADDICKS.—An article illustrated by diagrams giving a detailed analysis of the different items which make up the tank resistance in an electrolytic copper refinery. Fig. 1 shows the evolution of the tank connections in refineries using the multiple process. *A* is the arrangement used in the first small installations. *B* is a modification employed at the old Anaconda refinery, long since dismantled. Here the parallel conductors resulted in halving the contact resistance between conductor bars and tanks without using any more copper, as each bar was made half size (*C*). Then *A* was expanded into twin tanks, as shown in *D*. This resulted in halving the conductor bars required, saving copper investment as well as voltage drop. Further, as the connections between twin tanks placed individual anodes and cathodes in independent pairs, it was claimed that a short-circuit between electrodes in one tank was limited in its damage to efficiency by the resistance in series in the adjoining tank. The old Anaconda tank *C* partly met this argument in that it was very wide, and two anodes were hung side by side from a single crossbar. This required hanging the anodes by hooks, however, and this in turn increased the number of contacts. Then came the Walker system, shown at *E*, where the

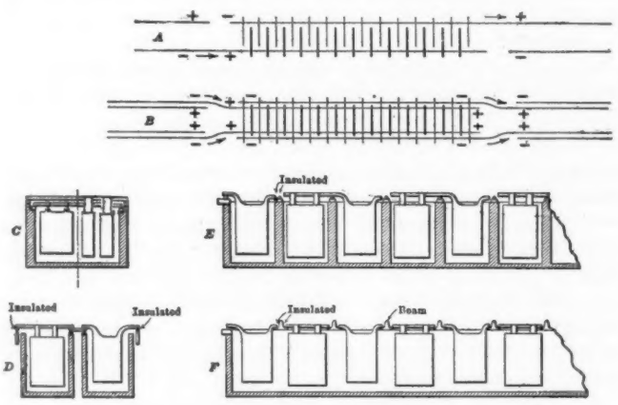


FIG. 1—VARIOUS TANK AND ELECTRODE ARRANGEMENTS

idea of *B* was expanded indefinitely, it being found feasible to sacrifice accessibility, which was still preserved on one side of each tank at *D*, to power and investment saving. This resulted in a great saving in conductor bars, and has been generally adopted. The connecting strips shown at *B* were dropped and a small triangular bar running the length of the tank partition substituted without appreciable loss in efficiency. These bars are very small in cross-section, as they carry but half the current flowing through a single electrode when a tank is in normal condition. Finally, we have at *F* a further extension of the group idea, which has been proposed by several, in which the individual tanks are merged into one great basin, the Walker formation of electrode connections being virtually maintained, the tank partitions and triangular bars being replaced by a suitable iron beam to carry the load of the electrodes. This plan has received but a limited application, as it introduces in a modified form some of the disadvantages of the series system due to higher voltages without compensating gains. It would greatly decrease the first cost of a tank house, however, as well as that of tank repairs. An idea of the magnitude of the different items constituting tank resistance may be obtained from Table I, which gives the results of an analysis of a tank house built on system *D*.

TABLE I—ANALYSIS OF TANK RESISTANCE

	Item	Ohms per Tank	Per Cent of Total
A.	Electrolyte	0.0000444	55.1
B.	Metallic conductors	0.0000131	16.2
C.	Contacts	0.0000113	14.0
D.	Counter e.m.f.	0.0000040	5.0
E.	Slimes, etc., by difference	0.0000078	9.7
	Total	0.0000806	100.0
A.	Electrolyte	0.0000444	55.1
B.	a. Leads	0.0000024	3.0
	b. Conductor bars	0.0000085	10.5
	c. Anodes	0.0000002	0.25
	d. Cathode rods	0.0000010	1.2
	e. Cathodes	0.0000008	1.0
	f. Connection strips	0.0000002	0.25
C.	a. Anode contact	0.0000026	3.2
	b. Cathode loop contact	0.0000043	5.3
	c. Cathode rod contact	0.0000044	5.5
D.	Counter e.m.f.	0.0000040	5.0
E.	Slimes, etc., by difference	0.0000078	9.7
	Total	0.0000806	100.0

The author discusses in detail the resistance of conductors, of contacts, the transfer resistance between electrodes and electrolyte and the electrolyte resistance. —*Met. & Chem. Eng'ing*, Nov. 15, 1916.

Units, Measurements and Instruments

Variable Self and Mutual Inductor.—H. B. BROOKS AND F. C. WEAVER.—An illustrated paper describing a new form of instrument for varying the self-inductance of a circuit or the mutual inductances between two circuits. It consists of two pairs of fixed coils held in stationary hard rubber disks between which a third disk carrying two coils is arranged to be rotated. The form (elliptical instead of circular) and the spacing of the coils were determined so as to secure the following advantages: (1) High time constant for the space occupied; (2) scale divisions of uniform length reading directly in units of inductance and (3) a static arrangement of the coils, which reduces the liability of errors caused by the proximity of other instruments or of conductors carrying currents. Diagrams and data are given from which instruments of this type can be designed for given uses. Comparison is made of the new instrument and of some other older forms of variable inductor, including the Ayrton-Perry.—*Scientific Papers Bureau of Standards*, No. 290, Oct. 12, 1916.

Telegraphy, Telephony and Signals

Duplex Balances on Long Submarine Cables.—WALTER JUDD.—Various phenomena lead to the deduction that even the relatively small capacity of the connecting wires concerned in a cable duplex system—such wires being generally of considerable length—enters into the problem of duplex balancing to an appreciable extent. Manifestations of these phenomena are: (1) A balance which has been observed to be good on one siphon recorder is often found to need more or less small readjustment when the circuit is transferred to another recorder or to a relay, the only difference being that another pair of connecting wires is used for the second piece of apparatus. (2) If both the cable and artificial line are disconnected from the system a small balance disturbance is invariably shown. (3) On what are known as oscillatory curb connections, such as those shown in Fig. 2, if large changes are made in the

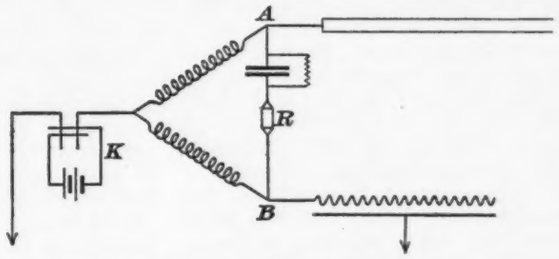


FIG. 2—OSCILLATORY CURB CONNECTIONS

capacity of the condenser or the resistance of the shunt over it, a previously existing good balance may be somewhat upset. (4) When the entire cross-circuit is short-circuited by connecting a wire of negligible resistance between the points *A* and *B* (Fig. 2), a disturbance of a good balance may be produced. These curious effects are likely to be attributed to defective insulation existing at some point of the system, but they are found to occur when all the apparatus and leads are known to be well insulated. In order to account for their occurrence it becomes necessary to dismiss from consideration the cable and artificial line and to study the connecting wires alone. It is shown by the author that the cause of these phenomena is the certain lack of symmetry due to the two connecting wires on either side of *R* having a capacity to earth. Several remedies are discussed; the best one proposed is to divide the coil of *R* into exactly equal parts R_1 and R_2, and to insert the condenser between these two parts as shown in Fig. 3. This provides a symmetrical arrangement at no greater cost than that of two similar additional lengths of connecting wire, the capacity of

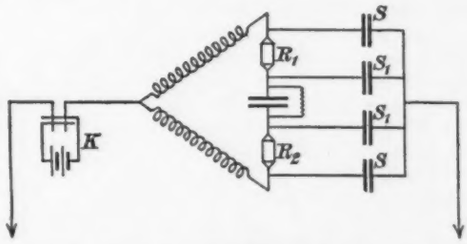


FIG. 3—METHOD OF INSERTING CONDENSER

which is represented by S_1. The diagram given shows the connections where a magnetic bridge-duplex system is in use, but the argument applies equally well to cases where a simple resistance bridge or a double-block condenser bridge is employed.—From the *Journal* of the (British) Institution of Electrical Engineers, reprinted in London *Electrician*, Oct. 27, 1916.

Ole Nelson has been appointed manager of the electric light plant at Bruce, S. D.

Norman McD. Crawford has been elected director and vice-president of the Columbus (Ohio) Railway, Power & Light Company.

S. N. Clarkson has resigned as sales engineer of the Union Electric Light & Power Company to accept a position with a large industrial company in that city.

W. T. Kyle, formerly manager of the New York office of the Duplex Metals Company, and for the last two years connected with the Okonite Company, is now sales agent of the Copperweld copper-clad steel-wire department of the New York office of the Page Woven Wire Fence Company.

Samuel H. Dailey, who has been vice-president and manager of the Binghamton (N. Y.) Light, Heat & Power Company, has resigned to accept the position of general manager of the Kentucky Traction & Terminal Company and the Lexington Utilities Company, both of Lexington, Ky.

P. A. Staples of Dover, N. J., has been appointed manager of the Binghamton (N. Y.) Light, Heat & Power Company, to succeed Samuel H. Dailey, recently resigned. Mr. Staples was recently transferred from Sandusky, Ohio, to Dover, where he held the position of vice-president of the Sandusky (Ohio) Gas & Electric Company.

O. W. Jones, who has been superintendent of the meter and distribution department of the Columbus (Ohio) Railway, Power & Light Company, has resigned to accept a position in the commercial department of the Texas Power & Light Company, Dallas, Tex. H. S. Leavell, who has been assistant superintendent, will succeed Mr. Jones.

Herbert H. Kamm has been appointed assistant superintendent of the Harrisburg (Pa.) Light & Power Company. He recently resigned as electrical engineer of the Carpenter Steel Company of Reading, Pa. Prior to his connection with the Carpenter Steel Company he had been associated with the Metropolitan Electric Company of Reading, Pa., for twenty-three years.

Henry F. Holland has resigned as Pacific coast representative of the Simplex Electric Heating Company of Cambridge, Mass., to become manager of the electric range department of the Great Western Power Company, with an office at 511 Sutter Street, San Francisco. Mr. Holland is well known in the electrical industry, with which he has been connected for more than twenty years, the last eight or nine years having been devoted to electric heating. He has been active in Jovian circles on the Pacific coast, and besides being first tribune for southern California served last year as president of the Los Angeles Jovian Electrical League. In his new position his entire time will be devoted to developing the domestic electric cooking load on the lines of the Great Western Power Company in its San Francisco and suburban territories.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

F. C. Anderson has resigned as city electrician of Grand Forks, B. C.

W. T. Gilroy has succeeded Badge Davis as district manager of the Interstate Public Service Company at Newcastle, Ind.

Arthur L. Freyer, for the last nine years superintendent of the Walkerton (Ind.) electric light plant, has joined the staff of the Plymouth (Ind.) Electric Light & Power Company in charge of high-tension transmission lines.

William Mueller, for a number of years manager of the pole department of the Western Electric Company at Chicago, is now with B. J. Carney & Company, 1729 McCormick Building, Chicago, as sales representative for Western red-cedar poles.

F. D. Egan, the president-elect of the Association of Iron & Steel Electrical Engineers, was born at Frostburg, Md., in 1882. He was educated at the University of Pittsburgh, and during the time he was in college he was connected with the Homestead Steel Works, the Westinghouse Electric & Manufacturing Company, and the Carrie Furnace Company. From 1907 to 1911 he was assistant superintendent of the electrical department of the National Tool Company. Later, during the construction of the New Midland plant of the Pittsburgh Crucible Steel Company, he was electrical engineer

F. D. EGAN

for that concern. In 1914 he was made steam and electrical engineer for the Pittsburgh Crucible Steel Company, which position he still holds. In addition to being an active worker in the Association of Iron & Steel Electrical Engineers, Mr. Egan is a member of the American Institute of Electrical Engineers and of the Iron & Steel Institute.

E. J. Wallis, who has been Southern district manager of the Western Electric Company for the past eight years, with headquarters at Atlanta, Ga., has been promoted to the position of district manager with headquarters at San Francisco, Cal.

F. B. Gleason, who has recently represented the Western Electric Company in Japan, has been appointed Southern district manager of the company, with headquarters at Atlanta, Ga., succeeding E. J. Wallis, who was recently transferred to San Francisco, Cal.

Herbert T. Hartmen of St. Davids, Pa., who has been president of the Chester Valley Electric Company of Coatesville, Pa., and its parent company, the Municipal Service Company of Philadelphia, since they were organized in 1911, has disposed of his stocks and retired from both companies.

J. F. Knowlen, general superintendent of the Alabama Power Company at Anniston, Ala., has tendered his resignation to take effect immediately, in order to accept a position as general superintendent of the Columbia (S. C.) Railway & Light Company. Mr. Knowlen has been in Anniston three years.

George B. Baker of the banking firm of Baker, Ayling & Young of Boston, Mass., has been appointed president of the Municipal Service Company of Philadelphia, Pa., which controls the Chester Valley Electric Company of Coatesville, Pa., and other companies, to succeed Herbert T. Hartmen, recently resigned.

H. M. West has been appointed commercial manager of the Harrisburg (Pa.) Light & Power Company, to fill the vacancy caused by the resignation of P. H. Bailey. Mr. West was graduated from the University of Kentucky in 1905, and since which time he has been connected with the New York Edison company, both in its commercial and engineering departments. For the past year he has been with the Westinghouse Church Kerr & Company, of New York, consulting engineers.

A. E. Bettis has been assigned the new title of superintendent of engineering and construction in the Kansas City Light & Power Company, which carries with it authority over the construction, maintenance, operating, trouble and similar departments. Mr. Bettis has heretofore been chief civil and mechanical engineer of the company, having been made chief engineer in 1910, at which time he was given charge also of the Kansas City Heating Company's mechanical division of work. He had been with the engineering department since 1904 in the light company and with the heating company since the plant was built in 1905.

Obituary

Frederick W. Fleitz, a prominent attorney of Pennsylvania, who had appeared in many important utility cases, including the recent Philadelphia rate case, died at Scranton, Pa., on Oct. 28, in his fiftieth year.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

An Electrical Insulation

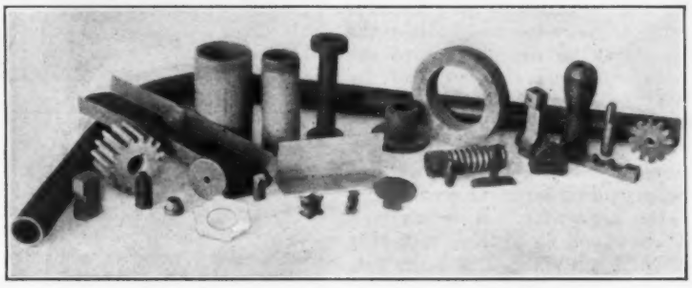
The Diamond State Fiber Company, Bridgeport, Pa., has developed and patented a process for manufacturing on a commercial scale a new form of electrical insulation. This insulating material, which is called Condensite-Cellulac, is said to be entirely different in physical and chemical characteristics from any other form of fiber, hard rubber, mica or synthetic insulation now available. It is homogeneous throughout and combines in great part the stable physical and chemical properties and high dielectric resistance of the well-known Condensite molding preparation of the Condensite Company of America, which is employed in its manufacture, and as well the good qualities of the best vulcanized fiber.

Condensite-Cellulac, it is claimed, is permanently anhydrous and non-hygroscopic, and is impervious to the action of oil or ordinary acids or solvents. It is infusible and is not affected by the action of heat within the range of temperature ordinarily encountered and hence cannot break down, setting free substances which may attack and corrode conductors or connections. It will stand considerable vibration or shock.

The use of this material in locations exposed to the weather, it is pointed out by the maker, will undoubtedly comprise a considerable part of its field of application, as it is strictly weatherproof. It may also be used advantageously in apparatus which is to operate under unfavorable conditions of moisture, or subject to splashing with oil, such as insulation for automobile ignition systems, or where exhaust steam is used in industrial processes.

This insulating material is furnished to the trade in merchantable shapes—sheets, rods, tubes, etc., and is readily machined. It may also be formed into very thin sheets (.015 in. or less) of accurate gage, making it a satisfactory diaphragm material.

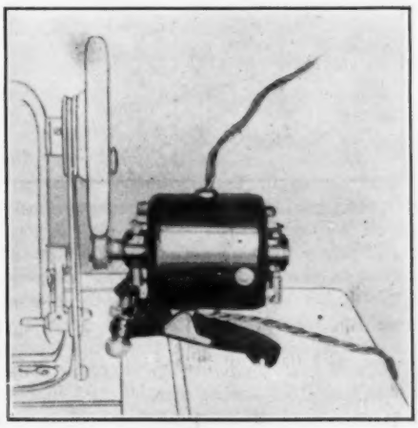
A unique feature of "Condensite-Cellulac" is the possibility of supplying it in the soft, uncured state, permitting of its being hardened in the place where it is to be used, and thereby formed to fit in spaces or locations with an accuracy not otherwise possible. Thus, for instance, gaskets for hot lines, steam, hot water, compressed air, etc., may be accurately fitted to rough flanges and cured in place by the heat of the line.



SHAPES AND PARTS MADE OF NEW INSULATING MATERIAL

Sewing Machine Motor

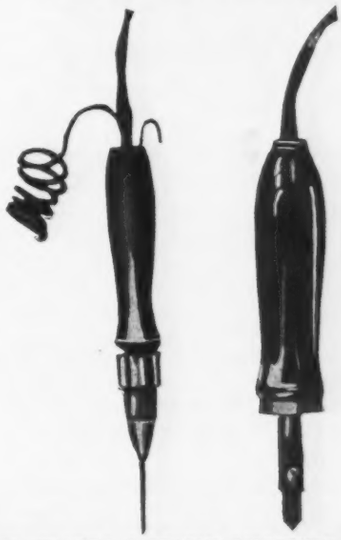
A design of sewing machine motor, operating either on alternating or direct current, is a recent product of the Menominee Electric Manufacturing Company of Menominee, Mich. The base of the motor has rubber feet with adjustable legs to offset any raise in the base-board of the sewing machine. The fulcrum is offset in such a way that the weight of the motor against the sewing machine flywheel assures the necessary friction without clamps or screws. The small flywheel on the motor is also of rubber. A rheostat is furnished which provides four speeds. The motor and rheostat are permanently connected so that the only connection necessary to use the motor is the screwing of an attachment plug into a lamp socket.



MOTOR THAT OPERATES ON ALTERNATING AND DIRECT CURRENT

Electric Soldering Irons

Generation of heat at the point of contact and at the spot where the heat is needed for soldering, brazing or annealing purposes, is the basis for the design of an electric soldering iron now made by the Clemens Electrical Corporation of Buffalo, N. Y. Another feature claimed for this iron is that the operator need not wait for the iron to get hot, since the instant the object to be soldered or brazed touches the two high-resistance heating points, these points glow with a white heat directly at the tips where the heat is needed. The moment the tool is taken from the work, after the object is soldered, the current ceases to flow, as the circuit between the high-resistance points is opened. The high-resistance points when they become used can be readily renewed at a small cost. The prongs are made of solid bar brass with nickel-plated finish and accurately machined. In the two-prong iron, the bushing that holds and separates the prongs is of molded asbestos. The handle is made of bakelite, compressed under 600 deg. Fahr.



TWO HANDLE PORTABLE SOLDERING IRON

This soldering iron operates on low voltage, the range being from 6 to 15 volts. The high-resistance points are made to carry current according to ratings of 150, 250 and 500 watts.

A two-handle portable outfit is made which consists of a single-prong soldering tool attached to one wire of the secondary side of a transformer, and a soldering feed tool attached to the other secondary wire of the transformer. The single-prong point is brought to bear upon the object to be soldered and solder-feeding tool is placed on the spot when needed. This outfit is es-

pecially adapted for soldering of all descriptions, such as big wires behind switchboards and general repair work.

Bond Tester Equipment

A portable storage-battery equipment has been devised by the Roller Smith Company, 233 Broadway, New York City, for use with its bond tester. The equipment comprises a carrying case in which there is mounted an Edison A-5 storage battery of 187.5 amp.-hr. capacity, as the source of current; an ammeter range 60-0-60 amp. to show rate of battery charge or discharge; a rheostat whose first step is an open-

PORTABLE STORAGE BATTERY FOR USE WITH BOND TESTER

circuit step and whose succeeding steps are used for establishing and bringing to correct value the rail current; and a knife-blade switch for interruption of circuit during transportation. There is also a compartment for carrying the cables and clamps. The weight of the equipment is about 45 lb. and the dimensions of the containing case 12 in. wide by 7 in. deep by 15 in. high.

Improved Automobile Starting and Lighting Battery

Improvements which render its automobile starting and lighting battery more nearly foolproof and more sturdy have recently been made by the Philadelphia Storage Battery Company, Philadelphia, Pa. The company has been careful that the battery weight should not become excessive, and has built a battery for which is claimed a weight of about 15 kw.-hr. per pound. In this battery, as in all others made by it, the company uses the diamond grid. This grid, the framework of the plate, is made of lead slightly hardened with antimony. It is built on the order of the old-fashioned steel-truss bridge, the steel members forming lattice work in the shape of diamonds. There is a diamond lattice on each surface of the plate, the members on one surface being staggered in relation to those of the other surface, as shown in Fig. 1. The result, it is claimed, is a framework in which the strains of expansion—due to the sulphation of the atoms of lead in the active material in the plate—are absorbed and equalized, preventing the plate from buckling and the edges of the grid from breaking.

As a further precaution against plates in the starting battery getting together and causing internal short-circuits, an improved hardwood separator is used. This separator is made by quarter-sawing the logs of a special variety, leaving the grain parallel with the grooves which are cut on one surface of the separator. A chemical treatment of the wood neutralizes the acids that may be detrimental to the lead plates and removes enough of the resin from the alternate layers of wood to make the separator porous. Each soft or porous layer of wood is buttressed on each side by a hard, resinous layer, providing strength and toughness in the separator. It is claimed that the hardwood separators will still be good when the plates are worn out.

To prevent the escape of the acid by splashing or capillary creepage, each cell in the battery is individually sealed. The jars are made of the usual vulcanized rubber, but the cover and method of sealing is special. The cover is of molded hard rubber, so constructed that the minimum amount of acid-proof sealing wax or compound is required to seal it into the mouth of the jar. Furthermore, the cover is made so that it surrounds and seals the terminal posts. These lead posts must come to the surface in order that the cells may be connected together. To prevent acid creeping up the post a cup is molded in the

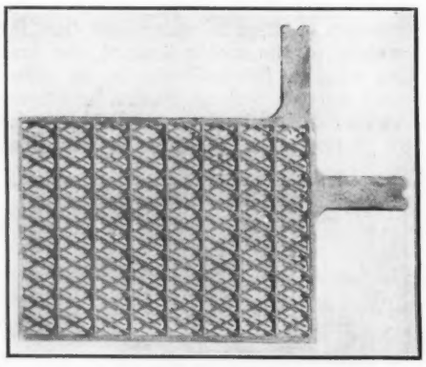


FIG. 1—LEAD AND ANTIMONY GRID

cell cover in such a fashion that it surrounds the post and provides a receptacle for the acid-proof sealing compound, which is melted and poured in to fill the space. On the lead post is provided a series of petticoats somewhat similar to the petticoats on insulators used in high-tension line construction. The hot sealing compound flows between the petticoats, covering the post in such fashion that capillary creepage cannot be started. As a consequence, no acid will reach the surface of the battery by way of the post.

The necessary vent for the escape of gas and for filling the cell with distilled water is provided in the center of the cover. The vent is of such proportions that one can easily see whether or not the plates and separators in the cell are properly covered with water. To prevent splashing of acid through

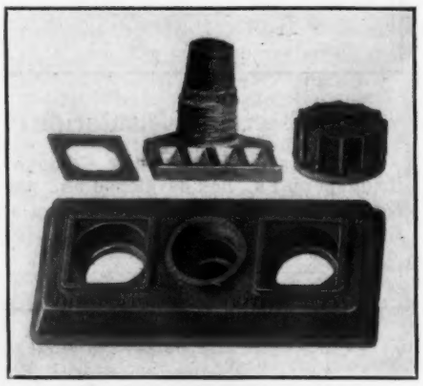


FIG. 2—MOLDED HARD RUBBER COVER AND PARTS

this vent, a large molded hollow vent cap is provided. The under side of sheet, which acts as a baffle plate to prevent acid from splashing up through the cap. In the baffle plate are three small holes to permit of the escape of gas. The cap being hollow provides a small expansion space for this gas, which finds its way out through three other small openings in the top of the vent cap. The accompanying illustration of the cell cover shows these points.

The improvements in the Philadelphia diamond grid starting battery, such as the diamond grid itself, the hardwood separator, the petticoated post and molded cover, have been covered with patents by the Philadelphia Storage Battery Company.

Deep Well Pump and Water Supply

For supplying the water, under pressure, to residences, small apartments, etc., the A. Y. McDonald Company of Dubuque, Iowa, is offering the trade a complete water supply system, which includes a deep well pump or a double-acting force pump. The pumps are operated by 1/8 and 1/3 hp. direct-current or alternating-current Westinghouse motors, designed for continuous service.

The deep well pump is for direct pressure systems. It is intended for use in wells where the water is from 25 to 100 ft. from the surface. The pump has a rating of from 120 to 180 gal. an hour, depending upon the size of cylinder used. An air chamber of ample capacity is provided on the discharge line. An air compressor is regularly furnished and is driven from the crosshead, insuring a positive air supply to the tank at all times. A pressure tank of not less than 52-gal. capacity is recommended by the maker, though larger tanks are preferable. This pump is sold separately or as part of a system consisting of pump or working head, motor, air compressor, elec-

tric switch, cylinder and pressure tank. The electric switch is designed to start the motor when pressure falls to 20 lb. and stop it when pressure reaches 40 lb.

The double-acting force pump is furnished as part of a complete water supply system for furnishing water from shallow wells and cisterns not over 25

ELECTRICALLY OPERATED DEEP WELL PUMP

ft. deep. Motor, switch and pressure tank are included. The pump has a capacity of 180 gal. an hour, and the entire outfit is mounted on a cast-iron bed plate, making an exceedingly compact and well arranged unit. Both outfits may be operated by current from an ordinary electric light socket.

Jeweled Time Switch

The A. & W. Electric Sign Company, Prospect and West Third Streets, Cleveland, Ohio, is now offering the trade an

AN EIGHT-DAY SEVEN-JEWEL TIME SWITCH

improved time switch. The plates and wheels are all extra heavy to insure long wear and the balance is compensated for temperature changes. The entire escapement is jeweled, seven jewels being used. The arbors are all of special hardened steel with the pinions cut from solid bronze. The switch mechanism is entirely separate from the time train and each switch is arranged so that it will close the circuit twice and open it twice within twenty-four hours if desired. It is also provided with a cutout for Sunday or holiday use.

Wiring Devices for Foreign Trade

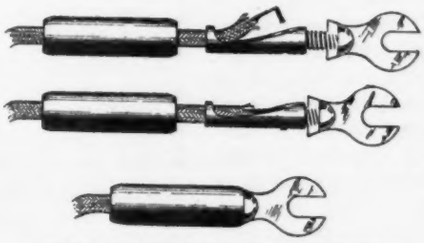
Wiring devices, made exclusively for the foreign trade are shown in the accompanying illustration, as manufactured by Pass Seymour, Inc., of Syracuse, N. Y. These articles are not

NORMAL EDISON BASE LAMP SOCKETS FOR FOREIGN TRADE.

suitable for use in this country and are exact copies of goods formerly made in Germany. They consist of a normal Edison base for use on temporary or cheap work, a continental type of single pole fuse block, and several types of normal Edison base lamp holders of European design. Lamp holders with the Goliath or mogul base are also furnished.

Solderless Terminals

Terminals that make positive contact with a wire without the use of solder are shown in the accompanying illustration as manufactured by the Meliorate Manufacturing Company, 240-246 Hall Street, Brooklyn, New York. The body and faces of these



STEPS IN INSTALLING TERMINALS

terminals are of hard drawn brass, machined and nickel plated. The sleeve is of hard fibre specially treated which makes it moisture and temperature proof and is reinforced by the body throughout. The wire, when passed through the body and an eye in the terminal lug, is gripped by the contact which screws into the body as shown in the illustration. The whole combination is further strengthened by the insulating sleeve which when turned to its final position locks the parts rigidly together. The wire retains its original flexibility, it is claimed, as it is not annealed as is the case when soldered into the terminal. The body of the terminal is large enough to admit the insulation on the wire and prevents it from slipping and fraying.

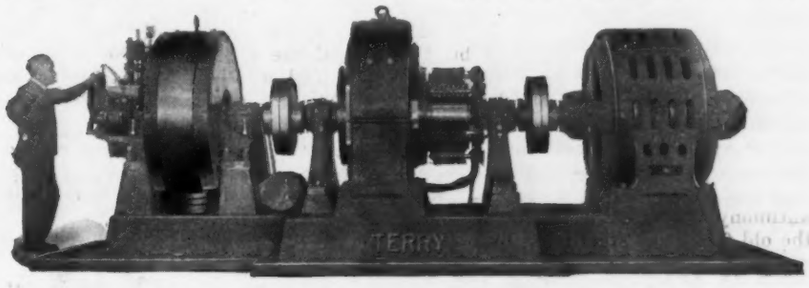
The faces of various styles of terminals of "A" and "B" sizes are interchangeable with other faces of the same size, the sizes being adapted to current capacity. The sleeves are furnished in red and black for denoting polarity.

Large Exciter Units

The three exciter units which are now being installed in the new power plant of the Buffalo General Electric Company have a number of interesting features. To insure the plant against loss of excitation, two independent sources of power are provided for driving each exciter. Each unit consists of a 300-kw. exciter direct-connected to an induction motor at one end, and to a steam turbine at the other end. The governing mechanism of the turbine is so arranged that if the power for the induction motor should fail the turbine will automatically pick up the load. In case of trouble on the main circuits the exciters can be depended upon to take care of themselves without attention, so that the operators can give all their attention to clearing up the trouble on the main circuits.

Another advantage of the duplex exciter drive, it is pointed out, is that it gives the exciter unit a higher all-day efficiency than either a motor-driven or a steam-driven exciter. This maximum efficiency is secured by driving the unit from the turbine end when the station is operating at full load and the turbine exhaust can be efficiently used in the heaters, and by shifting the drive to the motor end when the station load is light, the main generators being able to carry the exciter load at such times.

The large capacity of the units (300 kw. normal), the high pressure and temperature of the steam supplied to the turbine (275 lb., 275 deg. superheat) and the duplex drive feature, make these units an interesting factor of the plant equipment. The turbines were manufactured and the units installed by the Terry Steam Turbine Company, Hartford, Conn.



EXCITER UNIT WITH TWO INDEPENDENT SOURCES OF POWER

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

MEETING OF SOUTHEASTERN SECTION, N.E.L.A., AT TAMPA

Ten Papers Dealing with All Phases of Operation and Management Create Lively Discussion Among 150 Southern Operators

At Tampa, Fla., Nov. 15-17, the Southeastern Section of the National Electric Light Association held its fourth annual convention, attended by 150 members. This section draws its membership from central stations in those states, which comprise much of what has been called the "old South," including North and South Carolina, Georgia, Florida and Alabama. It is the outgrowth of the Georgia State Section, organized in 1910, and is now one of the strongest and most enthusiastic of the National Electric Light Association geographical sections.

The program, which called for five sessions and the presentation of ten papers, was fittingly opened by Mayor D. B. McKay of Tampa in a cordial address of welcome. J. A. Griffin, cashier of the Exchange National Bank of Tampa, followed with an address on "Banking and Its Relations to Public Utilities," in which he outlined the function of public service corporations and explained what good service really means. T. C. Martin, executive secretary of the National Electric Light Association, gave an interesting review of important developments in the electrical industry and showed how the N. E. L. A. as a factor in this work has grown to an organization of thousands of central station men. He commended the work being done by Georgraphical sections, and pointed out their importance in future development of the industry.

The customary address of the section president, J. C. Woodsome of the Tampa Electric Company, closed the first session. Mr. Woodsome commented on the industrial development of the South and the part that central station service has played and will play in the future. He said that while in the past profits have come primarily from developments along mechanical and electrical lines, in the future the greatest profits will come from the development of employees, who deal with the public and represent the company. Developments in various industries brought about by electric service, including the field of electric heating and cooking and lighting and electrical power, were briefly touched upon.

Second Session

The second session was opened by John H. Finney, manager of the Aluminum Company of America, Washington, D. C., who read a paper entitled "The Conservation and Direction of Human Energy." An earnest plea was made for legislation, both national and state, which will permit the development of available water power and the conservation of resources, not only by the use of the water but by the consequent saving of coal otherwise used in steam stations. The growing field for the engineer in many national matters and the need of greater interest in this field was emphasized in order to develop the nation's material resources in an intelligent and economical way.

In discussing this paper, W. E. Mitchell, operating manager of the Alabama Power Company, Birmingham, Ala., pointed out that in Alabama alone there is about 1,000,000 hp. in undeveloped water power, with only about 100,000 hp. developed, this being due to the fact that companies are unable to get government permits. He cited a case where a $5,000,000 industrial company was kept out of the South because of this fact. This company located in Canada, making it impossible for the South to ever take advantage of the money which otherwise might have been invested there.

The second paper, by Arthur Williams, commercial agent of the New York Edison Company, New York, dealt with municipal ownership. In the absence of Mr. Williams, this paper was read by C. F. Porter of New York. This subject was discussed by William Rawson Collier, contract agent of the Georgia Railway & Power Company, Atlanta, Ga., and C. D. Flanigen, vice-president Athens (Ga.) Railway & Electric Company. It was pointed out that the central station of to-day has two competitors, one the isolated plant and the other the municipality, the latter always threatening to either go into business as a competitor or buy out the existing plant.

"Accounting, an Essential of Management," was the subject of the next paper, by F. G. Whitney, auditor of the Southern Utilities Company, Jacksonville, Fla. This paper was in the main a plea to engineers for recognition of the field for professional accountants, and pointed out a great many ways in which the management of public utilities can develop accounting methods in an efficient way.

The morning session on Nov. 16 was opened by a paper entitled "The Maintenance of Central Station Electrical Instruments," by F. M. Farmer, chief engineer of the Electrical Testing Laboratories, New York City. In this paper emphasis was laid on systematic maintenance of all instruments used by public utility companies, including those on switchboards of power plants and substations. The importance of accuracy was explained and curves were presented to show the effects of wrong voltage on candle-power of tungsten lamps and on the revenue from lighting at various rates. The operating features of ammeters, wattmeters and frequency meters were briefly touched upon and the possible errors pointed out. This paper was discussed by W. E. Mitchell, operating manager of the Alabama Power Company, Birmingham, Ala., and P. A. Tillery, assistant general manager of the Carolina Power & Light Company, Raleigh, N. C. The point was brought out that while the voltmeter should be accurate at all times, on alternating current lines, instrument transformers as well should be checked. This is especially important with those companies where cotton mill loads are connected, since constant characteristics of the energy supply are essential in the manufacture of their products. Low speed means slower operation of new machinery with corresponding decrease in production and loss of revenue.

The paper on "Advertising Electricity, Its Service and Application," by J. C. McQuiston, was next presented. The author explained the importance of ad-

vertising in selling electrical goods and dwelt on the value of newspaper advertising to public service companies,

THIRD SESSION

"Recent Developments in Steam Turbines," by M. B. Carroll, General Electric Company, Lynn, Mass., was the subject of the first paper at the afternoon session on Nov. 16. The features of small and moderate-sized turbines were dealt with especially, and lantern slides illustrated manufacturing processes. Emphasis was laid on the problems of manufacturers due to the increasing size of modern turbine units requiring novel machine tools of unusual size.

"The Future Street Lamp" was the title of the paper read by W. P. Hurley of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

"General Store and Window Lighting" was the subject of the next paper, by F. E. Lauderbach and Norman Hickox, special representatives of the National X-Ray Reflector Company, Chicago, Ill.

FIFTH SESSION

The last session, on Nov. 17, was opened by a paper entitled "The Heating-Device Load," by Frank Hammond, general agent of the Birmingham Railway, Light & Power Company. The heating device was mentioned as an important factor in dispelling the evil of a peak-load "bugbear" in the minds of plant operators. In reference to the use of small heating devices, especially irons, it was pointed out in the paper that in one Southern city where 350 irons were sold at a special sale and the addresses of 295 buyers placed on file, a canvass six months later showed that 63 per cent of these irons were in use on an average of two hours per week. The results of a special sale in Birmingham, Ala., during which 1197 heating devices, exclusive of irons, were sold, were also outlined.

The last paper of this session, entitled "Grounding of Secondaries and Lightning Arresters," by E. P. Peck, discussed means of preventing dangerous voltages on customers' premises from any outside source. The safety features of secondary grounding were dealt with and methods outlined by which this can be made effective. Reference was made to the investigation of distribution circuit lighting arrester protection made by D. W. Roper of Chicago and presented before the Cleveland meeting of the American Institute of Electrical Engineers.

The report of the hydroelectric committee was presented at the close of the last session by its chairman, W. E. Mitchell of the Alabama Power Company.

Public Service Commission News

Pennsylvania Commission

The Public Service Commission has adopted a resolution fixing the fiscal year for reporting purposes to end Dec. 31. Companies that have been reporting to the commission have been notified that they will file the usual annual report for the fiscal year ending June 30, 1916.

California Commission

The Railroad Commission has issued an order fixing the rates to be charged by the Western States Gas & Electric Company for gas and electricity sold and distributed in its Eureka division. The new rates, which went into effect on Nov. 20, retain the $1 monthly minimum charge for gas, fix $1.55 for the first 1000 cu. ft. of gas used a month and $1.30 a thousand for the next 1000 cu. ft. A discount of 5 per cent is allowed for payment within ten days of date of bill. The commission says that if bills are promptly paid, the proposed rate is a slight reduction over the rate now in effect for the first 1000 cu. ft. a month, and a substantial reduction for the second 1000 cu. ft. a month.

New electric rates are established on a basis for general lighting of 10 cents for the first 50 kw.-hr. a month, 9 cents for the next 50, 8 cents for the next 50, 7 cents for the next 100, and so on down to a rate of 4 cents a kilowatt-hour a month for all consumption over 1800 kw.-hr. A monthly minimum is $1 a meter a month with a 10 per cent reduction if paid within ten days from date of bill.

The decision says that the company does not earn more than 6 per cent on its gas and electric properties in its Eureka division, but that the problem which the company seeks to solve cannot be solved by increasing its rates, as such increase could not be justified by the worth of the service to the consumer, and if attempted, would probably decrease the company's gross revenue. The commission says further that the only solution is an attractive rate to customers and the reduction of electric production expenses. This problem, says the commission, has been frankly discussed with the Western States company's officials, and they agree with the commission that, instead of an increase, certain rates should be reduced.

Idaho Commission

Another order and ruling of the Public Utilities Commission, has been affirmed by the Supreme Court. That tribunal has handed down a decision in the case of the city of Coeur d'Alene versus the commission and the Interstate Utilities Company in which it is held that the evidence is sufficient to support the findings of the commission to the effect that the rates of the company at Coeur d'Alene are not unreasonably high and exorbitant.

The Interstate Utilities Company operates a telephone system at Coeur d'Alene and the city alleged that the rates charged were unreasonable, and that therefore a large number of patrons of the company had discontinued their telephones and the service rendered was very poor and unsatisfactory. The commission made an investigation and found that the service rendered was faulty and inadequate, to a certain extent, but that such conditions were due to cramped operating conditions pending the installation of a new switchboard and other apparatus and that the consolidation of the Interstate Telephone Company with the Pacific Telegraph & Telephone Company was demanded by the city officials of Coeur d'Alene. It was therefore held that the rates were not unreasonable and the complaint was dismissed. An application for a rehearing later filed was denied and an appeal was carried by the city to the Supreme Court.

"Where two telephone systems are being consolidated and during the time of the consolidation changes are made and poor service is occasioned," says the Supreme Court, "by reason of the overhauling of the switchboard and the remodeling of practically the entire central station of the system, the connecting of all lines on one system and the breaking in of new help, and the commission finds that the company will overcome such service difficulties when such changes are completed, and further finds that the company thereafter will render first-class service, this finding will not be disturbed on a review by this court, under the evidence in this case.

"Where the commission has taken the evidence of the city as to the value of the plant, for rate-making purposes, but denies any deduction from such value on account of depreciation as suggested by city's expert witness, and finds, that the plant is in first-class condition and as good as new and is capable of rendering 100 per cent efficient service, such finding will not be disturbed, since it is supported by the evidence."

Protection for Telephone Wires.—In erection and maintenance of its trolley wires carrying a heavy electric current across a space over which telephone wires were strung, the railway company is bound to make effective provision against communication of current to the telephone wires, it was held by the Supreme Court of Appeals of West Virginia (90 S. E. 230).

Admission of Expert Testimony.—Evidence of admission of expert testimony showing general neighborhood practice is contained in Raymond versus Rutland Railway, Light & Power Company (98A 909) in which the Supreme Court of Vermont held that testimony of an expert electrical engineer of his long familiarity with equipment of electric light poles, etc., and that lag screws, such as used by defendant, were not in general use for holding arc lights in position, and describing and showing devices that were in general use in the locality, within a radius of 100 miles, was admissible.

Negligence Contributed by Pulling Street Lamp Suspension Cord.—What part the negligence of the public, which persists in pulling street lamp suspension cords in an endeavor to relight the lamp, plays in injury cases came up before the Supreme Court of Vermont in Raymond versus Rutland Railway, Light & Power Company (98A 909). The court held that in an action for death caused by electric company's wires, where defendant claimed that the accident was caused by the decedant's meddling with an electric light, refusal to charge for defendant that if deceased, just before the accident, undertook to light the lamp by taking hold of the suspension cord and shaking the lamp, the plaintiff could not recover was proper, even though defendant's evidence tended to show that fact, since the request denied recovery whether anything resulted from the shaking or not. A requested instruction that, if the method used by defendant to suspend the lamp was sufficient to keep it from falling if not interfered with, this was all defendant was required to do, was properly refused, as denying plaintiff recovery in case of interference from whatever source and however slight or casual. A charge, defining the legal duty of defendant company in the circumstances in fastening and securing its wires was proper. A charge that, in determining whether defendant company used due care, the jury might consider that the defendant should take into account the actions of strangers and the public generally was proper. An instruction that, if deceased undertook to light the lamp by taking hold of the suspension cord and shaking it the jury might find from that that he was guilty of contributory negligence, and that if he left the sidewalk and went out and interfered with the lamp, the jury might take such facts as evidence tending to show he was guilty of contributory negligence was proper, the jury not being bound to find that these things, if done, amounted to contributory negligence, since the question still remained whether these acts were the proximate cause of the accident.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Liability for Injuries Received from Fall of Unsafe Pole.—Where a telephone pole was set in the ground only about 18 in., and by reason thereof the company's lineman was injured by its fall when he had ascended it after making the usual tests, which could not have disclosed the defect, the company was liable according to the Court of Appeals of Kentucky (188 S. W. 765).

Operation Prior to Public Utility Act.—Where it did not affirmatively appear that an electric company had not, prior to the time when the public service commission act went into effect, actually commenced to exercise its franchises in the territory covered by its charter, the court did not err in dismissing an appeal from the action of the commission refusing to interfere with the company's exercise of its franchise, it was held by the Supreme Court of Pennsylvania in Pennsylvania Utilities Company versus Lehigh Navigation Electric Company (98 A. 950).

Distribution Pole License Tax.—Where a city ordinance designated an annual fee charged on the maintenance of each telegraph pole in any public street, etc., as a license fee, without further explanation, it must be treated as a license fee, it was held by the Supreme Court of Illinois (113 N. E. 968). A city ordinance imposing an annual license fee of $1 for each pole occupying any part of a public street, would be presumed to be valid, and the burden was upon the telegraph company to allege and prove that it was unreasonable as providing for an excessive fee, unless it was so grossly excessive that the court could pronounce it unreasonable as a matter of law, and since courts will not readily interfere if the tax be excessive because of the presumption that the city will itself reduce the fees to a proper amount. An annual license fee of $1 for each pole to a company maintaining 242 poles in the streets, making the several owners of the wires on such poles jointly and severally liable for the fee on each pole, was not unreasonably excessive. In such action proof that the defendant telegraph company had paid its taxes locally and proof of the amount of its income and receipts from intrastate and interstate business and its expenses at its city office together with proof that the city had not spent any money for inspection of the poles and lines, and that no inspection has been made for the year, would not be sufficient to show that the license tax was unreasonably excessive, since the city might have arranged for each inspection for that year and have failed to make the inspection because the license fees were not paid.

Discontinuance of Service for Prior Contract Indebtedness.—The New York Supreme Court in (160, 865) shows that a certain telephone service was discontinued because of nonpayment of rentals under a prior contract. Such action is held to be unlawful, the opinion delivered by Judge Callaghan reading in part: "To put defendant's construction upon the contract would be to hold that it could, by right, discontinue service to a patron who might be indebted to it for any cause. Let us assume that the plaintiff was indebted to the defendant for material which it had sold to him, or for an advertisement which he had inserted in the telephone directory; could any one successfully maintain that such an indebtedness would furnish a sufficient excuse or reason for the defendant to breach its contract of service? I think not. Yet the contract provides that service may be discontinued for failure to pay any amount due."

Power of Supreme Court Over Commission Rulings.—Under the Public Service Commission Law empowering the commission to order reasonable extensions of the lines, etc., of gas companies, the Appellate Division of the Supreme Court, it was held in New York & Queens Gas Company versus McCall (113 N. E. 795) has no power to substitute its own judgment as to what was reasonable in place of the determination of the commission, and could only annul its order for the violation of law or of the Constitution or when beyond the power granted to the commission, when based on some mistake of law, when without evidence to support it or when so arbitrary as to be beyond the exercise of a reasonable discretion; nor does the Code of Civil Procedure prescribing the question to be determined by the court upon the hearing on a writ of certiorari, extend the power of the court to review such order; nor does the subdivision thereof permitting the court to set aside a determination as against the weight of the evidence, authorize the court to determine that the commission's order was unreasonable in the sense of being unwise or inexpedient. In such case, the appellate division's annulment of the order of the commission and the granting of a rehearing, in the exercise of its discretion, would not be reviewable in the Court of Appeals. An order of the commission, requiring the gas company supplying the territory where its plant was located to extend its mains to serve a community of about 332 houses, already supplied with electricity and which could have no gas unless supplied by the company, but which was required only for cooking during the summer months, etc., requiring the substitution of larger pipes for a distance of 5 miles, and a construction under a marsh and a navigable stream at a cost of between $60,000 and $70,000, with an increased return of $1,660 per year, about one-half of the interest at 5 per cent, on the cost of the extension, was not so unreasonable in the sense of being a capricious exercise of power that the commission's order for the extension would be annulled by the court.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Over 33,000 Industrial Electric Heating Devices in Use in Chicago.—A recent estimate made in Chicago shows that there are approximately 33,327 industrial heating devices electrically heated from the Commonwealth Edison's system. These devices represent a value of $325,145 and a connected load of 23,772 kw. About 85 per cent of the electrically heated industrial heating devices used in factories, workshops, etc., in Chicago are operated from Edison service.

Company's Band to Give Free Concerts in Communities Served. — Free concerts by the employee's band of the Edison Electric Illuminating Company of Boston, Mass., have been offered by the company to city officials of the communities served. In offering the services of band the general superintendent said: "As a further evidence of cooperative good feeling and Edison spirit, the Edison band offers to furnish a free out-of-doors, evening concert, devoid of advertising features, for each one of the towns and cities in the Edison territory. Arrangements as to time and place may be made with the manager of the band through Mr. Lott by the authorized representatives of the town or city, it being understood that no dates will be scheduled for Saturdays or holidays. I hope our friends will feel perfectly free in accepting this offer and will secure an early date, so as to avoid confusion."

New Electrical Equipment Wanted for Boston Drawbridge Service.—Mayor James M. Curley of Boston, Mass., has instructed Commissioner of Public Works Murphy to install at the earliest possible moment the following electric lighting and signaling equipment on all highway drawbridges within the city's jurisdiction, following an investigation of an accident on the Boston Elevated Railway Nov. 7, in which many passengers were drowned as the result of a surface car plunging into Fort Point Channel through an open draw: Reflector lamps arranged to flood-light gates and fixed signs on drawbridges when gates are closed; electric gongs interlocked with the bridge-operating mechanism to prevent the operation of the latter unless the bell is in operation, with provision for continuous ringing during the open-draw period; and illuminated signs reading "Stop When Draw is Open," to be installed at a distance of about 200 ft. from the draw, the illuminating apparatus to be interlocked with the bridge-operating and gong equipment. Bids will be asked for in the Boston City Record of Dec. 2, and about $10,000 is estimated as the cost of meeting the recommendations of the engineering committee.

Illinois University to Dedicate New Ceramic Building.—The college of engineering of the University of Illinois will dedicate its new Ceramic Engineering Building at Urbana on Dec. 6 and 7. This building, with its extensive equipment, constitutes a response which the university is making to the needs o the clay-working industries of the State.

A Service to the Public.—A new office was recently created within the Doherty Organization known as the Industrial Commissionership. The duties of the commissioner are to co-operate actively with the local chambers of commerce or boards of trade in endeavoring to induce new industries to locate in the town and in kindling civic pride among the citizenry. Persistent efforts of the industrial commissioner have just been crowned by getting the Taylor Chair Company of Bedford, Ohio, against strong competition, to move its plant to Bristol, Virginia-Tennessee. The Taylor Chair Company is one of the largest manufacturers in the United States.

Rates of Another New York Company under Investigation.—For the purpose of determining whether the rates charged by the Queens County Electric Light & Power Company shall be reduced, the company has been directed to appear before the Public Service Commission for the First District of New York for a hearing on Dec. 4. The company, which furnishes energy to consumers in Queens Borough, now charges a maximum of 12 cents per kilowatt-hour. The company has a maximum power rate of 10 cents from which certain discounts are allowed. The action of the commission in directing this hearing takes on a special significance in view of the fact that the commission recently issued an order directing the Edison Electric Illuminating Company of Brooklyn to reduce its rates, and acquiesced in important rate reductions made by the New York Edison Company following conferences between the commission, officials of the company, and city officials.

Massachusetts Company Establishes Free Insurance for Employees.—The Fall River Electric Company has established death benefits for its employees. Under this system the family or other dependents of an employee will receive the benefit in case of death of the employee from accident, occurring when he isn't engaged in his employment, and also in case of death from natural causes. The system has been established as a supplement to workingmen's compensation in cases of death from accident, and goes further and provides general death benefits where deaths result from natural causes, of which families and other dependents of all employees may be beneficiaries. The amount to be paid is equal to the amount paid to the deceased employee within the twelve months immediately preceding his death, provided that amount does not exceed $1,000, which is to be the maximum limit of amount paid. This rate of benefit is for employees leaving families or others who have been dependent upon them.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 1127 of this number.

Pittsburgh Section A. I. E. E.—The annual banquet of the section will be held at the Fort Pitt Hotel on Dec. 9. President H. W. Buck and George H. Neilson will deliver short addresses.

District Heating Convention to Be in Detroit.—The ninth annual convention of the National District Heating Association will be held in Detroit, Mich., on June 12, 13, 14 and 15, 1917. The headquarters of the convention will be at the Hotel Pontchartrain.

J. C. Schmidtbauer Heads Westinghouse Jobbers.—At the closing session of the Westinghouse Agent-Jobbers' Association convention held at the Homestead Hotel, Hot Springs, Va., Nov. 20 to 23, J. C. Schmidtbauer of Milwaukee, Wis., vice-president of Julius Andrae & Sons Company, was elected president.

Wisconsin Contractors' Annual Meeting.—The fourteenth annual meeting of the Electrical Contractors Association of Wisconsin takes place at Milwaukee at the Hotel Wisconsin Jan. 15 to 17 next. An open session will be held in the afternoon of the second day, followed by a dinner in the evening. As business the past year has been quite good an unusually large attendance is expected.

Pacific Service Section, N. E. L. A.—S. J. Lisberger, engineer of distribution, Pacific Gas & Electric Company, and his assistants demonstrated and explained the fundamental principles in various processes involved in the generation and transmission of electrical energy at the recent meeting of the section. The purpose of the demonstration was educational, the idea being to give employees in various departments of the Pacific Gas & Electric Company a clearer knowledge of the company's product.

Independent Telephone Convention.—The annual convention of the United States Independent Telephone Association will be held in Chicago on Dec. 5, 6, 7 and 8. The following technical program will be carried out: Wednesday afternoon, "Transmission Line Interferences," by L. E. Hurtz, Lincoln, Neb.; "Legal Phases of Transmission Line Interferences," by H. L. Beyer, Grinnell, Ia.; "The National Safety Code," by Dr. E. B. Rosa, Bureau of Standards, Washington, D. C.; "Good Operating," by W. S. Vivian, Chicago. Thursday morning, "Standard Long Distance Telephone Operating Practices," for general discussion. Thursday afternoon, "Costs of Service," by George C. Mathews, Chicago; "The New Advertising," by Roy D. Mock, Chicago; "Getting the Business, from the Viewpoint of the Larger Companies," by Rollo R. Stevens, Columbus, Ohio.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

TUNGSTEN LAMP PATENT LICENSES

Lux Manufacturing Company Signs First, Others Are Expected to Follow Soon

The first of the licenses to be issued by the General Electric Company for permission to manufacture tungsten incandescent electric lamps under the Just and Hanaman patent has been issued to the Lux Manufacturing Company. Other licenses have been offered, and they will be signed as soon as the necessary data can be obtained.

As was stated in the ELECTRICAL WORLD for Oct. 28, all independent lamp manufacturers except the Independent Lamp & Wire Company, with which the General Electric Company is in litigation concerning the Coolidge patent for a drawn-wire filament, will be offered a license on certain terms. As was there explained, these terms, while they regulate the output, still permit a growth in proportion to the growth of the market for incandescent lamps.

LARGE ELECTRICAL TRADE EXPECTED IN MEXICO

Jobbers Now Have Representatives in Important Cities in the Interior and Will Expand as Conditions Permit

Recent advices from Mexico point to an increasing demand there for electrical goods. When the revolution broke out the republic had a very satisfactory electrical trade. The country was well covered by salesmen representing the various supply houses. These men for the most part were called in but are now again going out, and the latest dispatches state there are agents of the larger supply houses actively engaged in all of the principal cities of the interior of the country. As conditions permit the range of representation will broaden.

Mexican jobbers, however, are finding difficulty in securing electrical merchandise from the United States. It is practically impossible to obtain merchandise of special design while shipments of standard goods are greatly delayed. Some Mexican jobbers who formerly dealt with a limited number of manufacturers and export merchants now find it necessary to greatly increase this number in order to obtain a satisfactory stock in a reasonable time.

NEW PRICE BASIS ADOPTED FOR WIRING SUPPLIES

Conditions Incidental to Increase in Price of Raw Materials Market Necessitates Abolition of Former Practices

Prior to the present year, conduit, wire, sockets, switches, and other wiring supplies, were bought and sold on a price basis that corresponded with the market price at the date of order, and not at the date of delivery, unless the delivery price was lower than the purchase price when the buyer expected the lower price. Conditions, however, in the metal market reached such a state of uncertainty that a new basis for prices became necessary.

On the rising market the seller, under the former practices, would make no money owing to the advance in metals, but when the market swung back he would have to bear all of the losses. As this became more evident, sellers of wiring supplies began to refuse quotations on future delivery. Only on delivery from stock would prices be quoted. The rule that went into effect was that all prices should be as of date of delivery.

The manufacturer has found that he must buy his materials and pay for his labor this way. Manufacturing costs are continually rising, and it is no longer safe to sell on any other basis than delivery date.

The jobber, of course, is not faced with the manufacturing problem. If he is to keep an adequate stock then he must have the advantage of the rising market in order to be properly protected against a falling market.

EXCELLENT MARKET FOR HEATING APPLIANCES

Retailers Have Stocked Heavy on Some Lines and Light on Others Because of Prices and Delayed Deliveries

In spite of high prices the demand this winter for heating appliances has been unprecedented and it is expected that the retail sales this Christmas will be greater than ever. Retailers, it is believed, have stocked up well but not regularly. By this it is meant that retailers have stocked heavy on some lines and light on others. To a large extent this has resulted from manufacturing conditions. If it was possible to get a stock of one item and little of another the retailer took what he could. However, it is felt that the price situation also had no small effect on stocking. Retailers fought shy of articles that had increased to what was thought to be prohibitive prices.

Retailers, however, will undoubtedly have little difficulty in disposing of these large stocks, for formerly when a customer asked for a gift suggestion, the retailer mentioned several suitable articles, whereas, with a particularly large stock, say of toasters, he will probably quote one of these offhand when asked for a suggestion.

Those retailers who have neglected to lay in a stock until the last minute, as has been the custom of many stores in the past, will probably now be too late. Manufacturers are months behind in deliveries. Jobbers' stocks also have been pretty well depleted.

TAPER SHAFTS FOR MOTORS ARE BECOMING STANDARD

Change in Motor Construction Dictated in the Interests of Economy to Both the Manufacturer and the User

Manufacturers of electrical motors are coming around more and more to the use of taper shafts for all standard motors. The demand for taper cuts, although now confined for the most part to special-purpose machines, is such as to indicate that the time is not far distant when all standard motor shafts will be tapered and that all pinions, couplings, brake disks, chain-drive wheels and pulleys will be provided with taper bores. A drift in this direction will enable the manufacturer of motors who is now compelled to make and stock at least two and sometimes three kinds of shafts to standardize on but one. At present a large percentage of standard motors is built for belt drive, and the shaft extensions are made for mounting pulleys. When these are sold for gearing or couplings the customer is obliged to cut off the shaft to the proper length and specially fit his pinion or coupling.

It is being recognized now that all the troubles, delay and expense of this special work will be avoided if pinions, chain wheels and couplings were provided with standard taper bores. Moreover, if the manufacturer can make all of his motors with only one kind of shaft, and thus avoid

the expense and delay of putting through motors with special shafts, and possibly of changing shafts and motors already completed, and can put his motors in stock with the certainty that they may be used for all kinds of drive, the resulting economies will much more than counterbalance the small extra cost of making the taper fit. Besides, the knowledge on the part of the user that he can obtain from stock motors which are suitable for any kind of drive which he desires to use; that he will not be obliged to wait until motors with special shafts can be made; and that he can use his motors interchangeably for different drives and have no difficulty in removing pulleys, gears, etc., will undoubtedly stimulate the sale of motors for all kinds of electric drives.

Some objection has, of course, been raised to the use of taper shafts because of the supposedly high cost of making the taper and the difficulty of obtaining pulleys, couplings, etc., from manufacturers of those articles. Those manufacturers who have gone into this matter find that with suitable tools, which are not expensive, the labor cost is not very great. In fact, a taper can be turned on the end of a 2-in. shaft, including cutting the thread and the nut on the end of the shaft, complete with washer, for approximately 50 cents. The manufacturers of pulleys will, of course, furnish taper-bore pulleys for the same price as those having straight bores if the demand for them is great enough. The movement, most manufacturers feel, will be gradual, but inevitable.

COPPER WIRE BASE PASSES THE FORTY-CENT MARK

Factories Sold Out Well Into 1917—Prompt Delivery at a Premium and Hard to Obtain in Any Event

It was reported early in the week that copper wire base could be obtained in limited quantities for 1916 delivery at 40 to 41 cents. The price, however, was nominal, each sale having its own quotation. For January shipments quotations of 39.75 cents are being made and 37 cents for March, all quotations f.o.b. factory.

Practically all mills are sold out to Feb. 1 and some as far in advance as July 1, 1917. For this reason, it is very difficult to obtain prompt deliveries, and even if possible to get them they command a premium of 1 cent to 1.5 cents.

On Monday copper was quoted at 34 cents for 1916 delivery in a very strong market. Prices for 1917 delivery sloped off from this mark but did not go below 30 cents, the quotation for last quarter delivery.

Buyers will therefore enter the December market with the metal around 35 cents and with practically none to be had except that held for better prices by speculators.

Since iron and steel are advancing also and labor is receiving more and more money, it seems almost certain that another advance will have to go into effect all along the line of electrical manufacture. Some electrical manufacturers, it is known, are looking forward to the new year's bringing better conditions, but such opinion is not shared generally. It is probable, however, that price increases have been held up in a hope that the new year would ameliorate conditions somewhat.

TRADE ACCEPTANCES ARE RAPIDLY GAINING FAVOR

Electrical Jobbers Now Selling Merchandise to Trade on That Basis—Advantages of System to the Industry

More than one electrical jobber is now using the trade acceptance credit system to advantage with the electrical contractor and dealer. Those who use the system report that it is very satisfactory and far superior to the old open book-account system.

The jobbers using trade acceptances instead of extending credit under open accounts have found it possible to obtain more liberal terms at the bank and therefore have been able to carry more stock. This has proved to be more than an ordinary advantage during the past twelve months when the stock of wiring supplies kept on hand by jobbers was double that of normal times.

In explaining the system to contractors and dealers the jobbers point out (1) that the buyer who is not in a position to take cash discounts will by accepting his debts be better able to compete with the cash buyer; (2) that the trade acceptance by showing on its face that the obligation is made for a purchase of goods establishes rather than reflects on the acceptor's credit; (3) that the contractor by giving a negotiable evidence of indebtedness to the jobber shows his good faith and by meeting his obligation improves his credit, and (4) that by the training in paying on a certain date the contractor will become a more careful and intelligent buyer and will increase his profits accordingly.

RECORD EXPORTS OF INSULATED WIRE AND CABLE

Value of Electrical Merchandise Shipped Abroad in September Was $3,491,217, Making a Total of $27,019,840 for the First Nine Months of 1916

Exports of electrical merchandise manufactured in the United States amounted during September last to $3,491,217, in comparison with $2,262,291 in September, 1915. September thus stands next to August as the largest electrical export month on record so far as total value is concerned. Outside of insulated wire and cable, and of miscellaneous merchandise, however, the September figures were but a few dollars greater than those for September, 1915. In both insulated wire and cable and miscellaneous supplies the September exports were record breaking.

Prior to September, exports of insulated wire and cable had never reached the half-million mark. The September figures were $513,946. Miscellaneous merchandise was exported during September to the value of $1,924,295, or over $1,000,000 more than during September, 1915.

Articles	September 1915	September 1916	Nine Months Ended September 1915	Nine Months Ended September 1916
Batteries	$123,377	$157,051	$987,378	$1,331,054
Generators	109,990	108,453	1,559,513	1,129,872
Fans	33,193	23,593	263,914	255,231
Insulated wire and cables	318,478	513,946	2,082,778	3,012,318
Interior wiring supplies, etc., including fixtures	57,871	71,840	663,037	646,624
Arc lamps	397	982	17,242	12,946
Carbon filament lamps	7,041	7,577	104,461	71,606
Metal filament lamps	118,464	86,503	539,059	1,066,601
Meters and other measuring instruments	51,044	85,395	447,281	624,242
Motors	417,375	327,727	2,461,000	3,465,002
Telegraph instruments (including wireless apparatus)	5,681	10,671	80,364	120,761
Telephones	37,180	39,933	720,100	1,217,793
Transformers	76,433	103,251	451,663	801,935
All other	906,767	1,924,295	6,862,160	13,263,855
Total	$2,262,291	$3,491,217	$17,239,950	$27,019,840

There was a falling off in September of tungsten lamp exports and of motor exports. In the former line the foreign demand has been large, but although domestic factories are now working at maximum production the home market is in a position to absorb more than the factories can turn out.

For the first nine months of the current year the exports of electrical goods were $27,019,840, as compared with $17,239,950 during the corresponding period of 1915. With the exception of miscellaneous equipment and tungsten lamps, it is doubtful if the 1916 exports will be as large as those in 1915 and previous years. Exports of generators, fans, interior-wiring supplies, arc lamps and carbon lamps were less in value. The others are greater in value, but if the greatly increased cost of labor and metals has found expression in export prices then the foreign sales are running behind former years.

Based, however, on the figures in the accompanying table, which was compiled by the Bureau of Foreign and Domestic Commerce, the 1916 electrical exports should reach a total of over $36,000,000.

Manufacturing and Industrial

William J. Hammer, consulting electrical engineer, announces the removal of his office to 55 Liberty Street, New York City.

The Elliott-Parker Electric Company of Cleveland, Ohio, has filed plans with the city building department for a new four-story addition to its factory on Hamilton Avenue.

The Rosenthal Electrical Laboratory of Camden, N. J., has announced the development of new insulated and special vacuum electrodes for violet ray high frequency work.

Ashley P. Peck, formerly construction engineer for the Nash Motors Company, has accepted a position with the Arnold Company, engineers and constructors, 105 South La Salle Street, Chicago, Ill., as new-business representative.

Arthur V. Farr, who for the last three years has been advertising manager of the S. K. F. Ball Bearing Company, Hartford, Conn., has accepted the position of sales manager of the Hess Steel Corporation of Baltimore, Md.

Electric Cable Company, 122 South Michigan Avenue, Chicago, Ill., announces the opening of a Chicago warehouse with a complete stock of "Ecco" insulated wires and cables, and is now prepared to make prompt shipments of all sizes from this point.

Increase in Simplex Prices.—Another increase in the prices of Simplex toasters and heating pads went into effect on Nov. 16. This is the first increase in the price of Simplex pads this year. Prices on other heating appliances were advanced in September, including the price of the toasters.

Moore Steam Turbine Company.—In describing the single and multi-stage steam turbines made by this company on page 1018 of the Nov. 18 issue of the ELECTRICAL WORLD the statement was made that steam turbines in sizes from 1 to 5000 hp. are now being manufactured by the company at Wellsville, N. Y. This is incorrect, as this company manufactures turbines only in sizes up to 1000 hp.

The Union Electric Company of Pittsburgh, Pa., has been appointed exclusive selling agent in the United States for "Duraline," which is a lamp coloring that is weatherproof, heatproof and waterproof and gives a transparent effect. It is made in all standard shades and colors, which it is claimed will not fade or darken. Lamps may be colored by immersion in a cold solution of this coloring and only about three or four minutes are required for the lamps to dry.

Nehring Electrical Works, DeKalb, Ill., has been recently incorporated under the laws of the State of Illinois for $100,000, with the following officers: President and general manager, Paul A. Nehring; vice-president, E. C. Chandler; treasurer, L. E. Peck, and secretary H. Miller. The company manufactures weatherproof wire and cable, and will manufacture special machinery for insulated-wire plants. The company is even running at full daytime capacity, and is arranging to begin running a night shift soon.

Westinghouse Automatic Stokers with Auxiliary Equipments for Japan.—Twenty-seven, new type, forced draft, high reserve capacity stokers of the underfeed type have been sold by the Westinghouse Electric Export Company of East Pittsburgh, Pa., for service in Japan. The stokers are for use with 600 hp. boilers. Twenty of them were sold to the Osaka Electric Light Company, two to the Negoia Electric Light Company, and five to the Imperial Steel Company. The orders also included engines for operating the stokers, turbine and motor-driven forced draft fan units, controllers, and other auxiliaries.

Leffel Wheels for Small New England Developments.—James Leffel & Company, Boston, Mass., have received a number of contracts for the rehabilitation of a number of the smaller New England water powers. The contracts are all for vertical units designed to work under very low heads and direct connected to generators. The following contracts are announced: Great Barrington (Mass.) Electric Light Company, two 250-hp. 10-ft. head; Winchendon (Mass.) Electric Light Company, two 200-hp., 18-ft. head; Howland (Me.) Pulp & Paper Company, two 1050-hp. 20-ft. head; Twin States Gas & Electric Company, Dover, N. H., three 670-hp., 22-ft. head and two 400-hp. units.

Western Electric Agency in New Quarters.—The New England headquarters of the Western Electric Company have been located at 385 Summer Street, Boston, Mass., the company having recently occupied a new building for its exclusive use, thus combining the functions of salesroom, warehouse and district office. More than two acres of floor space are provided and the establishment, which will include extensive storage facilities for telephone and other electrical apparatus, requires three stories and a basement in a building situated in the newest industrial district of Boston, within easy walking distance of the South Station. W. F. Abely is New England sales agent of the Western Electric Company.

Westinghouse Electric Grants Employees a Bonus.—Announcement has been made by the Westinghouse Electric & Manufacturing Company of an extension of its present bonus system to include salaried and office employees on hourly rates by which they will receive a bonus of 8 per cent of their salary each month, providing their total excusable time absent and late during the month does not exceed six hours incurred on not more than three occasions. An additional 4 per cent will be given each month to the employee who has not lost any time from work during the month through absence or tardiness, those affected being thus enabled to obtain an increase in earnings of 12 per cent for a 100 per cent attendance. Several thousand employees in the Pittsburgh district are benefited by the granting of the bonus.

Farm Lighting Equipment for Chili.—Lieut. Carlos Bowen, Chilean Navy, is in the United States for the purpose of obtaining information from the principal electrical manufacturers in regard to electric light installation for isolated farms in the United States, with a view toward the application of farm lighting in Chili. At present countries of South America, according to Lieut. Bowen, burn oil and kerosene lamps on their farms, unless the proprietors are large farmers and enthusiastic men of industrial progress. The principal reason for this condition has been the poor information available in regard to electric lighting and power for such use, this being considered highly expensive. Lieut. Bowen is at present located at the Coast Artillery School, Fort Monroe, Va.

Canadian Trade Index.—Its close touch with the industrial developments in Canada gives the Canadian Manufacturers' Association exceptional opportunities to make its annual trade index a dependable list. In the 1916 edition several new features have been added, among them a continuous alphabetical list giving the name and address of every manufacturer appearing in the classified section, together with the various lines, export representatives and other useful information, and a French index of headings which has been supplemented by the addition of English headings. The price of the book is $5. It is published by the Canadian Manufacturers' Association, 1404 Traders Bank Building, Toronto, Canada. Alex. Marshall, manager of the commercial intelligence department of the Canadian association, is editor of the trade index.

NEW YORK METAL MARKET PRICES

	Nov. 21 Selling Prices Bid	Nov. 21 Selling Prices Asked	Nov. 27 Selling Prices Bid	Nov. 27 Selling Prices Asked
	£ s d	£ s d	£ s d	£ s d
London, standard spot	144 0 0		147 0 0	
Prime Lake	33.50	to 34.00†	33.50	to 34.00†
Electrolytic	33.50	to 34.00†	33.75	to 34.25†
Casting	32.50	to 32.75†	32.25	to 32.50†
Copper wire base	39.75†		40.00†	
Lead	7.00		7.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	19.00		21.00	
Spelter, spot	12.42½	to 12.67½	13.05	to 13.30
Tin, straits	45.25		45.50	
Aluminum, 98 to 99 per cent	58.00	to 60.00†	58.00	to 60.00†

OLD METALS

Heavy copper and wire	25.00	to 26.00†	23.00	to 29.00†
Brass, heavy	14.50	to 15.00†	16.00	to 17.00†
Brass, light	11.00	to 11.50†	12.50	to 13.00†
Lead, heavy	5.87½	to 6.12½†	6.25	to 6.50†
Zinc, scrap	7.75	to 8.00†	8.50	to 9.00†

COPPER EXPORTS

Total tons to Nov. 27 17,563

†Nominal.

Corporate and Financial

Great Western Power Company, San Francisco, Cal.—The Railroad Commission has issued an order authorizing the Half Moon Bay Light & Power Company to sell to the Great Western Power Company its business, franchise and assets for $47,500. The system consists of an 11,000-volt transmission line 24 miles long, extending from Daly City to 1 mile south of Half Moon Bay, together with 12 miles of distribution lines, transformers, etc. Energy for this system is purchased from the City Electric Company, a subsidiary of the Great Western Power Company of California. The Half Moon Bay company has 220 consumers. Its total authorized capital stock issue is $100,000, of which $84,400 is outstanding.

Indiana Power & Water Company, Bloomfield, Ind.—An issue of $200,000 first mortgage sinking fund 6 per cent gold bonds dated Sept. 1, 1916, and due Sept. 1, 1936, is being offered at par and interest.

Massillon (Ohio) Electric & Gas Company.—The company has completed arrangements to refund its present practically closed first mortgage bond issue, in the authorized principal amount of $500,000 maturing in 1948, with a new one of $2,000,000 authorized amount, to mature in 1956. The new issue will be secured by a first mortgage on all the property of the company. The Ohio Public Utilities Commission has authorized the issuance immediately of $540,000 (more or less) of the bonds, sufficient to effect the retirement of the present first mortgage issue, also permitting the company to sell $125,000 of 6 per cent cumulative preferred stock, which will make the outstanding amount of the preferred $250,000. The present earnings of the company are equivalent to four times the interest requirements of the new bonds, leaving a balance equal to over five times the preferred dividend. The growth of business of the company has been so great as to make necessary such financial arrangements as would provide for the required plant extensions now and in the future, and the present financing will supply this need.

Spokane (Wash.) Heat, Light & Power Company.—An issue of $1,000,000 of 6 per cent first mortgage notes, dated Aug. 1, 1916, and due Aug. 1, 1919, is being offered at par and interest.

Wagner Electric Manufacturing Company, St. Louis, Mo.—A meeting of the stockholders will be held on Jan. 8 for the purpose of voting on the proposal to increase the capital stock from $2,000,000 to $5,000,000. A portion of the new shares as may be determined upon by the board, based upon the surplus shown by the annual balance sheet, is to be paid up for surplus account, and distributed to stockholders pro rata with their holdings. A portion of the new shares, not to exceed 3000 shares, is to be sold to employees of the company at not less than $100 a share, and the proceeds, at the discretion of the directors, distributed to the stockholders of record in the form of extra cash dividends. The balance of the new shares is to be hereafter sold from time to time to shareholders pro rata, at par, or distributed in the form of stock dividends, as the future working capital requirements of the company will make necessary or permit.

New Utility and Industrial Companies

The North Side Battery Electric Company of New York, N. Y., has been incorporated by John F. Hanudel, John A. Hanudel and L. M. Hanudel of Flushing, N. Y. The company is capitalized at $10,000.

The Universal Power & Promotion Company of Philadelphia, Pa., has been incorporated with a capital stock of $100,000 to operate railways. The incorporators are: I. F. P. Taylor, Samuel Broadbent and C. A. A. P. Taylor, all of Philadelphia, Pa.

The St. Elmo Electrical Company of Chattanooga, Tenn., has been incorporated by W. A. Jewell, J. W. Lawless, Thomas Burns and James Harrington. The company is capitalized at $2,000 and proposes to deal in and install electrical equipment and apparatus.

The United Cable Conductor & Manufacturing Company has been incorporated with a capital stock of $100,000 by Herbert E. Latter and Norman P. Coffin of Wilmington, Del. The company proposes to manufacture a solderless electrical cable connector and specialties.

The Bush Electric Corporation of San Francisco, Cal., has been chartered with a capital stock of $25,000 to deal in electric therapeutic X-ray and accessory apparatus. The incorporators are: H. J. Ingersoll, William O. Eddy, W. G. Hargis, Jr., George L. Bush and L. C. Shingle.

The United States Electric Generator Company of Providence, R. I., has been chartered with a capital stock of $200,000 to manufacture and deal in electric batteries, generators, etc. The incorporators are: Arthur P. Manchester and Eli A. Wilcox of Providence, R. I., and Harry M. Spooner of Cranston, R. I.

Trade Publications

Switches.—The Detroit Fuse & Manufacturing Company, Detroit, Mich., has prepared a leaflet descriptive of Square D inclosed switches.

Coffee Filters.—The Silex Company, 45 High Street, Boston, Mass., has recently sent out several bulletins descriptive of its electrical coffee filter.

Pumps.—The Hill Pump Company of Anderson, Ind., has recently prepared an attractive folder entitled, "Electric Pression," descriptive of its pumps for home use.

Footlights.—The Universal Electric Stage Lighting Company, 240 West Fiftieth Street, New York City, has prepared bulletin DF descriptive of Kliegel disappearing footlights.

Line Material.—The Specialty Device Company, 112-114 West Third Street, Cincinnati, Ohio, has issued three leaflets descriptive of its anchors, augers and guy-wire protectors.

Rectifiers. — The Electric Converter Company, 840-846 Dorr Street, Toledo, Ohio, has prepared an illustrated booklet descriptive of its Little Giant Rectifier for charging automobile batteries.

Steam Turbines.—The Moore Steam Turbine Corporation of Wellsville, N. Y., has recently distributed illustrated bulletin No. 1 descriptive of its single and multi stage steam turbines and reduction gears.

Reflectors.—"Eye Comfort," the October number of the new loose-leaf form of house organ of the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has recently been received.

Starters and Controllers.—The Jewell Electric Company, Munsey Building, Baltimore, Md., has issued a bulletin descriptive of its automatic starters and controllers for electric motors, both alternating and direct current.

Cutting Off Machines.—The Newton Machine Tool Works, Inc., Twenty-third and Vine Streets, Philadelphia, Pa., has issued catalog No. 51 descriptive of its cold saw cutting off machines. This catalog is well illustrated and has been carefully prepared.

Lighting Fixtures.—The Pettingell-Andrews Company, Pearl Street and Atlantic Avenue, Boston, Mass., has recently distributed a new catalog of fixtures comprising the specially designed selection of thoroughly efficient lighting units to be encountered in its recently inaugurated commercial and industrial lighting department.

Railway Supplies.—Circular No. 1006 has recently been distributed by the railway and lighting department of the Westinghouse Electric & Manufacturing Company and has for its subject "Joe and the General Manager of the A. E. R. A. Convention." This circular contains comments on the exhibits of this year at the recent convention held in Atlantic City.

Grinding Wheels.—Catalog No. 9 descriptive of Star grinding wheels has been issued by the Star Corundum Wheel Company of Detroit, Mich. This 100-page book describes grinding wheels as they are made by three distinct processes, that is, vitrified, silicate and elastic, a brief description of each being given in the book. This company has also issued a safety code for the use and care of abrasive wheels.

New England

MANCHESTER, N. H.—Steps have been taken by the Manchester Traction & Light Company for the construction of a new dam at Gregg's Falls, 20 ft. below the old dam.

GAYSVILLE, VT.—The Gaysville Light & Power Company is planning to extend its electric transmission line to Barnard Village, to supply electrical service in that village and to farmers along the route.

HAWKESBURY, VT.—The Riordon Pulp & Paper Company contemplates building an addition to its boiler house, to cost about $30,000.

NORTH ADAMS, MASS.—Funds have been appropriated by the City Council, it is reported, for a new street-lighting system.

BRIDGEPORT, CONN.—The United Illuminating Company is installing a 7500-kw. Curtis turbo-generator set with auxiliaries, boilers and Taylor stokers.

BRISTOL, CONN.—The installation of a new street-lighting sytem in the business section of the city is being agitated by the Chamber of Commerce.

EAST HARTFORD, CONN.—A proposal has been submitted to the Board of Commissioners by the Hartford Electric Light Company for extensions to the local street-lighting system.

WATERBURY, CONN.—The United Light & Water Company of Waterbury, it is reported, contemplates the construction of a power plant at Devon, Conn., to cost about $1,000,000. The proposed plant will generate electricity for a large part of the Naugatuck Valley.

Middle Atlantic

AKRON, N. Y.—Extensive improvements are contemplated to the plant of the American Gypsum Company, including equipping the entire plant for electrical operation.

ALBANY, N. Y.—The Albany Southern Railroad Company is planning to build an extension of its railway to Troy. James E. Hewes of Rensselaer is general manager.

BROOKLYN, N. Y.—Bids will be received by A. Woods, police commissioner, at the bookkeeper's office, headquarters of the Police Department, 240 Centre Street, New York, for furnishing and installing electric-lighting and wiring system and fixtures at the 144th, 145th, 153d, 158th and 162d precinct station houses in the borough of Brooklyn. Plans and specifications may be obtained at the above office.

NEW YORK, N. Y.—The Public Service Commission has approved the award of the contract of the New York Municipal Railway Corporation to the G. E. Engineering Company of New York City, for furnishing tunnel lighting, station lighting, heating and ventilating systems in the Broadway and Canal Street subways, at $116,702.

NEW YORK, N. Y.—Bids will be received by the Department of Public Charities, tenth floor, Municipal Building, Manhattan, until December 4, under Contract 4, for necessary electrical work in connection with the removing of laundry machinery now in laundry buildings at the City Hospital and the New York City Home, and relocating same, together with certain new machinery in the laundry building, Metropolitan Hospital, Blackwell's Island. Blank forms and further information may be obtained at the above office.

OSWEGO, N. Y.—The Public Service Commission has given its approval of the extension of the franchise of the People's Gas & Electric Company of Oswego through the town of Sterling and the village of Fair Haven, a distance of 9 miles.

ROCKVILLE CENTRE, N. Y.—The Village Board is considering the question of purchasing a new generator and engine for the municipal electric-light plant.

ROSSIE, N. Y.—The installation of an electric-light and power plant in Rossie is under consideration. Negotiations, it is reported, are under way for the purchase of the old grist mill and old saw mill, with a view of establishing a power plant.

WILTON, N. Y.—The local power station of the Hudson Valley Railway Company of Glen Falls was destroyed by fire on Nov. 21, causing a loss of about $20,000. Work will begin at once on the reconstruction of the plant.

ERIE, PA.—Plans are being considered for the installation of an ornamental street-lighting system on State Street from North Park Row to Fourth Street. Property owners below Fourth Street are circulating a petition for an extension of the new system to the dock, and business men of State Street south of the post office are also interested. The proposed plan provides for the business men to pay the entire cost of the installation and the city to pay for the maintenance.

LEMOYNE, PA.—The United Electric Company of Lemoyne has filed an amendment to its charter increasing the capital dock from $103,500 to $1,000,000, the proceeds to be used to take up outstanding indebtedness and for proposed construction work.

PHILADELPHIA, PA.—The Eagle Ice & Coal Company contemplates building an addition to its engine room on Fifty-seventh Street.

PHILADELPHIA, PA.—The Keystone Spinning Mills Company is planning to erect an addition to power plant at its factory on North Second Street, to cost about $30,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company will install 500 new street lamps authorized by the City Council. This addition will make a total of 16,000 lamps operated by the company for the city at an annual cost of $1,500,000.

TOPTON, PA.—At the election held Nov. 7 the proposal to issue $23,000 in bonds for electric-light plant and improvements to waterworks was defeated.

NEWARK, N. J.—Upon recommendation of Commissioner Gillen the Board of Works is considering further plans for the erection of a municipal electric-light and power station in conjunction with the proposed garbage disposal plant on Elizabeth Avenue. The proposed incinerator plant will have a capacity of about 300 tons and will cost about $300,000.

NEWARK, N. J.—Percy B. Taylor, consulting engineer, has submitted a report to the Board of Freeholders recommending improvements and extensions to the power station at Overbrook Hospital, to cost about $60,270. The proposed work includes the installation of two 150-hp. boilers, a generator, underground piping to be installed in tunnels, and a vacuum return system installed in the heating plant.

NEWTON, N. J.—The Newton Electric & Gas Company, recently incorporated with a capital stock of $500,000, has applied to the Board of Public Utility Commissioners for permission to issue bonds to provide funds for proposed extensions and improvements.

TRENTON, N. J.—The Bell Telephone Company contemplates extensions to its local aerial cable system, to cost about $44,000.

HIGHLANDTOWN, MD.—The Shawnnigan Electro-Products Company, U. S. Fidelity & Guaranty Building, Baltimore, contemplates an addition of another unit to its plant in Highlandtown.

HYATTSVILLE, MD.—The installation of a municipal electric-lighting plant in Hyattsville is under consideration.

MORGANTOWN, W. VA.—William E. Glasscock, receiver for the Morgantown & Wheeling Railway Company, has petitioned the Monongalia County circuit court for permission to complete the electric railway of the company from Morgantown to Blacksville.

WHEELING, W. VA.—Extensive improvements will be made by the Wheeling Traction Company in the Wheeling district, including the installation of new machinery in the machine department on South Huron Street.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Washington, D. C., Schedule 412—Changing 110-ton trolley on crane to 135-ton and to dynamic braking; Schedule 398—725 lb. ebonite or hard rubber. Brooklyn, N. Y., Schedule 428—53 water heaters for ships' use, 38 trolley hoists; Schedule 408—eight water tube marine boilers. Brooklyn, Mare Island, Schedule 466-455—1150 lb. condenser tube packing; Schedule 405—four main feed water heaters; Schedule 404—eight main air pumps, dynamo and condenser, f.o.b. works; Schedule 434—208,725 lb. steel wire rope; Schedule 436—32,000 combination fuses. Puget Sound, Wash., Schedule 454—500 lb. bronze phosphor bronze wire; Schedule 457—1500 lb. seamless brass pipe. Mare Island, Cal., Schedule 452—Miscellaneous galvanized iron pipe fittings, 1464 galvanized malleable iron unions; Schedule 457—9000 lb. tubing for condenser ferrules, 804 composition unions. Boston, Mass., Schedule 410—two evaporators, two sets of steam blowers; Schedule 409—miscellaneous fire and bilge pumps, etc. Schedule 406—four transmitters and indicators combined. Schedule 430—2200 seamless boiler tubes. Various Schedule 417—miscellaneous galvanized steel pipe, miscellaneous steel tubing. Brooklyn, N. Y., Schedule 431—5000 ft. interior communication cable, 2000 ft. single-conductor wire, 60,000 ft. twin-conductor wire; Schedule 439—24 portable electric drills; Schedule 430—35 testing generators, 50 searchlight mirrors; Schedule 406—miscellaneous rotor shafts, disks, etc. Mare Island, Cal., Schedule 455—25 electric soldering irons. Newport, R. I., Schedule 398—two muffle type electric furnaces. Philadelphia, Pa., Schedule 407—two generating sets. Applications for proposal blanks should designate the schedule desired by number.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Commerce reports as follows; No. 29,910—An American consular officer in Spain reports that a trade-extension bureau in Spain desires to secure for one of its correspondents catalogs, in Spanish if possible, of machinery for pulling up stumps, light motors, ditch-digging machinery and wood-working machinery. No. 22,922—A firm in Portugal whose representative is now in New York, N. Y., desires to enter into commercial relations with American manufacturers of electrical supplies, etc. No. 22,924—A company in Venezuela is in the market for two 200-hp. water tube boilers with integral superheaters equipped with oil burners. Order will be placed through commission house in New York. No. 22,925—A public service company in Venezuela is in the market for a motor-driven centrifugal pump, capable of pumping 750 gal. of water per minute against a discharge of 125 ft. No. 22,931—The head of the supply department of a railway company in China desires to communicate with manufacturers of galvanized telegraph wire of which the company needs 7000 poods (about 126 tons). 22,970—A firm in Venezuela desires to represent American manufacturers of wire of all kinds, dynamos, electric motors, etc. No. 22,973—A firm in Denmark is in the market for black plates (dynamo sheets), size 1000 by 2000 by 0.5 m.m. Wattloss, 3.6 watts; quantity 100 to 200 tons. No. 22,997—An American in New Zealand desires to get into communication with American manufacturers of labor-saving devices, machines, implements, etc., for household use, such as automatic dish-washing machines, medium-priced vacuum cleaners, etc. No. 23,001—A manufacturer of incandescent lamps in Switzerland is in the market for pure platinum or platinum wire. No. 23,016—An import firm in West Africa desires to enter into commercial relations with American manufacturers of electric fixtures, pumps, hardware, electric fans, etc. Correspondence should be in French. No. 23,017—A Scandinavian business man who has been in the United States four years will return shortly to his native country. He desires to communicate with American manufacturers with a view of establishing sales agencies in Norway and Sweden for general machinery and factory equipment, including motors and motor vehicles, pumps, steam boilers, armatures, steam engines, electric dynamos and specialties, etc. Further information may be obtained upon application to the Bureau of Commerce, Department of Commerce, Washington, D. C., and its district offices.

North Central

GRAND RAPIDS, MICH.—The United Light & Railways Company of Grand Rapids has sold $1,500,000 of convertible debentures, of which the proceeds of $400,000 will be used to retire underlying bond issues, for payment of a small amount of floating debt, and the balance for construction requirements of subsidiary companies during 1917.

VERONA, MICH.—The contract for construction of a group of buildings for the Coats & Tweed Mining Company of Duluth, Minn., including a central heating plant, a machine shop, power house, etc., to cost between $175,000 and $200,000, has been awarded to the Foster Construction Company, Caswell Block, Milwaukee, Wis.

CINCINNATI, OHIO—The Union Gas & Electric Company has begun work on the construction of its new central electric generating station in Cincinnati, which when completed will cost about $6,000,000. The plant will be located on the Ohio River. Orders have been placed with the General Electric Company for two 25,000-kw. generating units; provision will be made for two additional units when required. Eight Babcock & Wilcox boilers have been ordered. About 40 miles of underground cables will be built and eight substations

will be remodeled and enlarged. The old generating station will be abandoned when the new plant is completed.

CLEVELAND, OHIO.—The construction of a power plant is under consideration by the Euclid-Dean Company, Euclid Avenue and East 105th Street, Cleveland.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 218, City Hall, Cleveland, until Dec. 6, for the sale of two used 50-kw. turbo-generators from the department of public utilities, division of water.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until Dec. 8, for furnishing transformers to the division of light and heat. Specifications may be obtained upon application to the office of the division of light and heat, Room 204, City Hall.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 218, City Hall, until Dec. 18, for furnishing and maintaining electricity for electric lamps for lighting the streets of Cleveland for the year beginning Jan. 1, 1917. Specifications may be obtained at the office of the superintendent of lighting.

GENEVA, OHIO.—The United Light & Power Company has submitted a proposal to the Council offering to install an ornamental street-lighting system, maintained by underground wires, in return for an extension of its commercial franchise for a period of 14 years.

HICKSVILLE, OHIO. — The Village Council has granted the North Western Ohio Light Company a franchise to operate an electric-lighting system in Hicksville. Arrangements, it is understood, will soon be made for a new street-lighting system.

LIMA, OHIO.—Bids will be received at the office of the director of public service, City Hall, Lima, until Dec. 14, for construction and improvements to waterworks, Contract No. 2, consisting of furnishing and erecting one 6,000,000-gal. high-service pump, three 4,000,000-gal. low-service pumps, two 25,000,000-gal. low-service pumps, two 225-hp. water tube boilers, turbo-generator and a 66-in. or 6-ft. by 150 ft. brick or concrete stack, together with all appurtenances. Plans and specifications may be obtained at office of either of the consulting engineers, R. Winthrop Pratt, Hippodrome Building, Cleveland, and William G. Clark, Spitzer Building, Toledo, Ohio, upon deposit of $10.

LONDON, OHIO.—The Board of Public Service has engaged C. C. Slater of Columbus, engineer, to prepare plans for remodeling the municipal electric-light plant. Two new generating units will probably be installed.

MASSILLON, OHIO.—Plans are being completed for extensive improvements and extensions to the power station of the Massillon Gas & Electric Company on South Erie Street, involving an expenditure of about $250 000. New equipment, including a new turbine, two new boilers, coal-handling equipment and stokers will be installed. The company has closed a contract with the National Pressed Steel Company to supply energy to the large plant the steel company is arranging to build a large plant on Columbia Heights. T. O. Kennedy is general manager of the Massillon company.

OXFORD, OHIO.—Bonds to the amount of $10,000 have been voted for rebuilding and extensions to the municipal electric-light plant.

TOLEDO, OHIO. — Announcement has been made by Henry L. Doherty that plans are being prepared for a new central station for Toledo, which may have an ultimate capacity of 120,000 kw. The plant may be located on the old rolling mill property on the East Side, but if this is too high for the purpose, the station may be placed outside of the city limits. The Water Street plant will be used to supplement the new plant. The cost is estimated at about $6,000,000.

INDIANAPOLIS, IND. — The contract for the new telephone exchange building, to be located on Belmont Avenue, near Washington Street, for the Central Union Telephone Company, has been awarded to the W. P. Jungclaus Company, at $38,100.

LOGANSPORT, IND.—Negotiations are under way between the city of Logansport and the Pennsylvania Railroad Company relative to the municipal electric plant supplying electricity for the new shops which are to be erected by the Pennsylvania company east of the city, and also for use in the present shops.

CHICAGO, ILL.—The Illinois Central Railroad Company, it is reported, is contemplating equipping its suburban system for electrical operation.

CHICAGO, ILL.—The Kling Brothers Engineering Works, 1302 Kingsbury Street, Chicago, is planning to erect a power house (one story), to cost about $4,000.

HARRISBURG, ILL.—Work will begin at once by the Southern Illinois & St. Louis Railway Company of Harrisburg on the construction of its proposed railway to connect Harrisburg, Marion, Johnston City, Herrin, West Frankford, Benton and St. Louis. An office will be opened in Marion, where the first work will begin, and placed in charge of L. F. Ripley. Frank Payne will continue in charge of the engineering department.

LA SALLE, ILL.—The Citizens Lighting Company contemplates making extensions to its plant here.

LINCOLN, ILL.—Preparations are being made by the Lincoln Water & Light Company for improvements to its system, including the building of a suction line from the wells to the power plant, a distance of about a quarter of a mile. E. MacDonald is general superintendent.

MONTGOMERY, ILL.—The Montgomery Hydro Electric Company has applied to the Public Utilities Commission for permission to issue $100,000 in capital stock and $100,000 in bonds, the proceeds to be used for a water power development on Fox River at Montgomery.

ST. CHARLES, ILL.—The city of St. Charles contemplates the purchsae of a 300-kw. turbo-generator and condensing apparatus for the municipal electric-light plant next spring. George Allen is superintendent of the municipal plant.

NEENAH, WIS.—The Wisconsin Traction, Light, Heat & Power Company of Appleton submitted a new proposal to the City Council offering to install a new street-lighting system. It is proposed to replace the arc lamps now in use with nitrogen lamps.

PORT WING, WIS.—Plans for the construction of a dam and hydroelectric plant on the Iron River in Bayfield County, 8 miles south of Port Wing, are reported under consideration by Wallin & Johnson, 252 Flymouth Building, Minneapolis, Minn. It is estimated that 10,000 hp. can be developed.

RICHLAND CENTER, WIS.—Work has been started on the construction of an extension to the municipal electric-light plant.

STOUGHTON, WIS.—The City Council has voted to purchase the Stebbinsville water power site, on which option was taken some time ago. It is estimated that 450 hp. can be developed. Plans are being considered for the construction of a plant.

WAUPACA, WIS.—The Waupaca Electric Service & Railway Company contemplates a number of improvmeents to its power plant.

ASKOV, MINN.—The installation of an electric-lighting system in Askov is under consideration.

BRICELYN, MINN.—Negotiations are under way between the City Council and the Consumers Power Company of Mankato for the installation of an electric-lighting system in Bricelyn.

ERSKINE, MINN.—The sale of $5,000 in bonds is being advertised by the city officials, the proceeds to be used for establishing an electric-light plant in Erksine.

ROLAND, MINN.—The installation of an electric-light and power plant in Roland is under consideration by the City Council.

SAUK CENTER, MINN.—A site has been purchased by the Council for the proposed municipal electric-light plant. The contract for plant has been awarded to Allis-Chalmers Company of West Allis, Wis.

STILLWATER, MINN. — Arrangements are being made to double the transformer capacity of the Northern States Power Company at the State Prison. When completed the company will be in a position to serve 800 kw. of the demand, and enable the prison directors to close down the private plant.

WACONIA, MINN.—The Northern States Power Company contemplates the erection of a transmission line from Waconia to Redwood Falls.

ANAMOSA, IOWA—The Board of Railroad Commisioners of Iowa has granted the Iowa Electric Company, Cedar Rapids, permision to erect and maintain an electric transmission line from Anamosa to Maquoketa for the purpose of furnishing electricity for lamps and motors to cities, towns and rural communities along the proposed line.

BURT, IOWA.—At an election to be held Dec. 9 the proposal to issue $13,000 in bonds to purchase an electric-lighting system will be submitted to the voters.

FORT DODGE, IOWA. — Orders have been placed by the Fort Dodge Gas & Electric Company for a 1500-kva. General Electric Curtis turbine for its local plant for emergency service. The turbine will be installed for non-condensing operation. The company obtains energy from the Boone plant of the Fort Dodge & Des Moines Southern Railway Company to operate its system.

GARNER, IOWA—The Iowa Falls Electric Company of Cedar Rapids has been granted a franchise by the Board of Railroad Commissioners of Iowa to erect and maintain an electric transmission line from the town of Garner to Belmond to supply electricity to towns, cites and rural communities along the proposed line. B. S. Wright of Cedar Rapids is engineer of the Iowa Falls Electric Company.

PRAIRIEBURG, IOWA.—The Electric Service Company of Central City has been granted a franchise to extend its transmission lines to this city to supply electricity for lamps, heaters and motors.

JOPLIN, MO.—The placing of telephone and electric wires underground on Main Street from Tenth to Twentieth Street is under consideration.

JOPLIN, MO.—The Empire District Electric Company of Joplin is contemplating improvements to its Spring River plant, to cost about $25,000.

PLEASANT HILL, MO.—L. K. Green & Company, which operate electric plants in Pleasant Hill and Lees Summit, contemplate the erection of an electric transmission line to connect the two cities. Improvements to the generating equipment at the local plant is also under consideration by the company.

ST. LOUIS, MO.—Mayor Kiel has signed the bill passed by the Board of Aldermen Oct. 20, appropriating $12,500 for a preliminary survey to determine the advisability of establishing a municipal electric-light plant. It will take 30 days for the bill to become a law and, it is estimated, it will take a year to complete the survey.

BERTRAND, NEB.—Bonds to the amount of $11,000 have been voted for the installation of an electric-lighting system.

FREMONT, NEB.—Plans are being considered by the City Council for the installation of a steam turbine in the municipal electric-light plant. The cost is estimated at $20,000.

OCONTO, NEB.—Local business men, it is reported, contemplate organizing a company to install and operate an electric-light plant in Oconto.

ODELL, NEB.—The local electric-light plant, owned by James Barry, was recently destroyed by fire.

OMAHA, NEB.—The Omaha, Lincoln & Beatrice Interurban Company is contemplating the construction of an electric railway from Lincoln to Omaha. J. M. Bramote of Lincoln is general manager.

OMAHA, NEB.—Bids will be received by the board of education, Omaha, until Dec. 7 for the construction of the Yates School Building. Separate bids to be submitted on heating, ventilating, plumbing, vacuum system and heat control and electric wiring. The cost of the building is estimated at $83,000.

HAYS CITY, KAN.—Bonds to the amount of $29,033 have been authorized, the proceeds to be used to purchase the property of the Hayes Electric Company and for improvements to same. Henrici, Kent & Lowry, Commerce Building, Kansas City, Mo., are engineers.

Southern States

MADISON, N. C.—The contract for the installation of the proposed municipal electric-light plant has been awarded to R. H. Milton of Greensboro. The cost of the plant is estimated at $8,000.

CHARLESTON, S. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 4 for construction of two wooden frame buildings, concrete piers and plumbing and electric-lighting systems; two guyed steel-pipe masts and one self-supporting steel tower, with concrete foundation and wooden piles, at the distant control naval radio station at Charleston. Plans and specifications may be obtained at the above bureau.

GREENSBORO, GA.—The installation of an electric-light plant in Greensboro is under consideration.

NEW SMYRNA, FLA.—The installation of an electric street-lighting system in New Smyrna is under consideration.

MEMPHIS, TENN.—The Chickasaw Cooperage Company, it is reported, will rebuild its power house, recently destroyed by fire.

CLANTON, ALA.—The town of Clanton has granted the Alabama Power Company a franchise to construct and operate an electric-light plant here.

LEIGHTON, ALA.—Bids will be received at the office of the town clerk, Leighton, until Dec. 15, for the construction of a public school building, the work to include all but the heating and lighting systems. J. T. Ferguson is chairman of board of education.

CHECOTAH, OKLA. — The installation of a municipal electric-lighting plant in Checotah is under consideration.

LINDSAY, OKLA.—Bonds to the amount of $6,000 have been voted for improvements to the municipal electric-light plant and water-works system.

ROCKY, OKLA.—The City Council has granted C. A. Mayhew a franchise to install an electric-light plant in Rocky.

VERDEN, OKLA.—The installation of a municipal electric-light plant is reported to be under consideration by the City Council.

BEEVILLE, TEX.—The city of Beeville is contemplating the purchase of the electric plant of the Southern Electric Company.

BRADY, TEX.—Plans are being considered for improvements to the municipal electric-light plant and water-works system. The installation of a complete new lighting system within two years is contemplated.

COLLEGE STATION, TEX.—Plans have been prepared for the construction of a fireproof power house and fireproof laboratory building at the Agricultural and Mechanical College, College Station. Copies of plans may be obtained from the Department of Architecture, College Station, at cost, if deposit is made to guarantee their return; cost of plans for power house is $2 and for laboratory plants, $3.50; a deposit of $25 is asked for each set of plans.

FORNEY, TEX.—The City Council is considering a proposal submitted by the Texas Power & Light Company of Dallas to extend its transmission lines to Forney and install a street-lighting system throughout the city.

GARWOOD, TEX.—The construction of an electric-light and power plant in Garwood is under consideration by J. J. Cooper and associates.

JACKSBORO, TEX. — The Jacksboro Mill & Elevator Company, which operates the local electric-light plant, contemplates the installation of new machinery.

NORDHEIM, TEX.—The Texas Southern Electric Company, Commercial Bank Building, Houston, is contemplating an extension of its electric transmission line to Nordheim and the installation of a local distributing system.

SAN ANTONIO, TEX.—The government telephone system at Fort Sam Houston is to be enlarged. A new switchboard will be installed and 15 additional trunk lines between San Antonio and the army post will be erected.

STREETMAN, TEX.—Application has been made to the City Council by John Carpenter, general manager of the Corsicana (Tex.) Gas & Electric Company for a franchise to install and operate an electric-light and power plant in Streetman.

Pacific States

HOQUIAM, WASH.—At an election held recently the proposal to issue $175,000 in bonds for the purpose of acquiring the distributing system of the Grays Harbor Railway & Light Company in Hoquiam or the construction of a new plant was defeated.

KEYPORT, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 18, for a telephone cable connection between the Pacific Coast torpedo station at Keyport, Wash., and the Puget Sound Navy Yard; also an electric power transmission line from the Olympic Power Company's pole line to the radio building at above named torpedo station. The cable line is to be about 58,900 ft. long, consisting of approximately 53,400 ft. of overhead construction, 3000 ft. of submarine cable and 2500 ft. of underground cable. The power transmission line shall consist of approximately 700 ft. of overhead three-wire and 1450 ft. of three-conductor submarine cable construction. Plans and specifications may be obtained on application to the above bureau or to the commandant of the navy yard named.

REPUBLIC, WASH.—The Pacific Power & Light Company of Portland, Ore., has petitioned the Commissioners of Adams County for a franchise to erect and maintain electric transmission lines on certain roads and highways in Adams County.

ST. GEORGE, WASH.—A. L. Woodhouse, who has purchased the municipal electric-light plant, is planning to install an entire new plant on the Santa Clara stream to supply electricity for lamps and motors in St. George and other settlements. Orders, it is understood, have been placed for equipment.

SEDRO WOOLLLEY, WASH.—The City Council is negotiating with the Pacific Northwest Traction Company of Seattle for a new street-lighting contract, which provides for replacing the present lamps with lamps of greater candlepower, and also improvements and extensions to the present lighting system.

MARSHFIELD, ORE.—The City Council has entered into a new contract with the Oregon Power Company which provides for a better street-lighting system.

PORTLAND, ORE.—Local surveys, it is reported, have been made by the Oregon Electric Railway for the construction of an extension of its railway to the Hill timber tracts above Cascadia.

LONG BEACH, CAL.—The Pacific Telephone & Telegraph Company has appropriated $10,000 for immediate use in installing additional underground cables here. The company, it is reported, has also appropriated $15,000 for the extension of cables to Seal Beach.

LOS ANGELES, CAL.—Plans are being prepared by the Sespe Light & Power Company of Los Angeles for the construction of a hydroelectric plant on the Ventura River, to be used in connection with an irrigation project. Ralph Bennett, Central Building, Los Angeles, is engineer.

MARE ISLAND, CAL.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 4 for furnishing two fitting out cranes at the navy yard, Mare Island, Cal. The government will furnish and install foundations and will also furnish and install necessary electric wiring and conduit to the main switch, which shall be installed by the contractor at the base of each crane.

YUMA, ARIZ.—Plans are being prepared for Greater Yuma project, involving an expenditure of $25,000,000, and to consist of a storage dam and reservoir at Yuma, dam bulwarks to include Prison Hill, Yuma and Indian Hill, Cal., spillways for water to Mexican lands to generate power for pumping waters to mesa lands and commercial purposes.

BUTTE, MONT.—The City Council has adopted a resolution providing for creating special improvement lighting district No. 221, which provides for the erection of 62 cast-iron or pressed steel posts for electric lamps, with necessary fixtures, etc., to cost about $5,000. Plans and specifications are filed in the office of the commissioner of public works.

TROY, MONT.—The Snowstorm Mining Company contemplates the construction of a railroad, concentrator and a hydroelectric plant, at a cost of about $500,000.

COKEVILLE, WYO.—Preparations are being made for the installation of an electric-light plant in Cokeville. The proposed plant will be located on Pine Creek and will be driven by water-power. Irvine McNeice is interested in the project.

CANON CITY, COL.—Negotiations are under way between the local business men and the city officials for the installation of an ornamental lighting system in the business district in Canon City.

DENVER, COLO.—Work has begun on the installation of the ornamental lighting system on Champa Street, from Fourteenth to Twentieth Street, to cost about $10,000. Plans for illuminating other cross streets are now under consideration.

GARDNERVILLE, NEV.—Preparations are being made by the Douglas County Milling & Power Company, which operates a large mill and lighting system in Gardnerville, to extend its lighting system throughout Carson Valley. The company is now building a large storage dam on the Carson River, one-half mile south of the old Rodenbaugh station. J. N. Anderson is manager.

Canada

WAINWRIGHT, ALTA.—The town of Wainwright has granted B. L. Perry of Edmonton a 10-year franchise to construct and operate an electric-light plant here.

PORT MOODY, B. C.—Steps have been taken by the City Council to dam up certain lakes recently discovered by J. H. Kilmer, city engineer at the source of Noon Creek, to protect its Noon and Scott creek water records.

TRAIL, B. C.—The Consolidated Mining & Smelting Company of Canada contemplates extensive improvements to the city lighting and power system, involving an expenditure of from $25,000 to $30,000.

VANCOUVER, B. C.—Plans have been filed and application made by the British Columbia Sulphite Company for privilege to store 100,000,000 gal. of water at Henrietta Lake in Cedar Valley, Howe Sound. It is proposed to construct a dam at the south end of lake and flood an area of 60 acres, to develop power to operate a pulp plant, which the company proposes to build.

WINNIPEG, MAN.—The Winnipeg Electric Railway Company, it is reported, is contemplating the construction of an electric railway between Winnipeg and Transcona.

LONDON, ONT.—The Public Utilities Commission, it is reported, will soon call for tenders on three 200-kw. oil-insulated, self-controlled transformers. E. V. Buchanan is general manager.

NORWOOD, ONT.—The local electric-light plant, it is reported, was damaged by fire recently.

TAVISTOCK, ONT.—Arrangements have practically been completed for receiving hydroelectric power. The plans also provide for the installation of 80 street lamps in connection with the local system.

TORONTO, ONT.—The Ontario Railway & Municipal Board has authorized the city to build and the Toronto Street Railway to equip and operate an electric railway on several streets in the city.

WINGHAM, ONT.—The Town Council is considering a proposal to utilize the town dam for the development of power. An engineer will be engaged to make investigations and report on the project.

HULL, QUE.—The Hull Electric Company contemplates extending its system on Chelsea and Montcalm streets.

LAKE MEGANTIC, QUE.—The plant of the Lake Megantic Electric Company was recently destroyed by fire. The plant, it is understood, will be rebuilt.

SHERBROOKE, QUE.—The City Council has awarded the contract for the erection of an electric transmission line between Weedon and Sherbrooke to the Two Miles Falls Power Company of Sherbrooke. The cost is estimated at $50,000. M. A. Sammett, McGill Building, Montreal, Que., is engineer.

MOOSE JAW, SASK.—Plans, it is reported, have been prepared by a local company for the installation of individual lighting systems in district at present isolated from central plants.

Miscellaneous

HONOLULU, HAWAII.—The Hawaiian Electrical Company of Honolulu has been awarded the contract for the installation of the new electrical equipment for the Hilo (Hawaii) Electric Light Company.

PANAMA.—Bids will be received at the office of the assistant purchasing agent, the Panama Canal, 24 State Street, New York, N. Y., until Dec. 5 for the purchase of electric motors, generators and air compressor offered for sale by the Panama Canal. Blanks and general information relating to this sale may be obtained at the above office. R. E. Rutherford is assistant purchasing agent.

PANAMA.—Bids will be received at the office of the assistant purchasing agent, the Panama Canal, 24 State Street, New York, until Jan. 3, 1917, for the purchase of generator sets, boilers, air compressors, crane, smoke stacks, air tanks, boiler feed pump, switchboard equipment, pipe and fittings, feed boiler heater and hot water meter, offered for sale by the Panama Canal. For details see proposal columns.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Dec. 15, for furnishing centrifugal pumps and equipment, etc. Blanks and general information relating to this circular (1104) may be obtained at the above office or the offices of the assisting purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Dec. 8, for furnishing steel, planished iron, steel castings, copper, brass, bronze, copper tubing, tin, lead pipe, steel cable, wire, electric wire, solder, steel pins, pipe fittings, radio sets, reflectors, electric fittings, fiber tubing, rubber rods, insulating cloth, tapes, etc. Blanks and general information relating to this circular (No. 1102) may be obtained at the above office or at the offices of the assistant purchasing agent, 24 State Street, New York; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kneisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C. Annual meeting, New York, Dec. 26-30.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus. Ohio. Meeting, December 2, Univ. of Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General Secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary John F. Kelly, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, E. Brettell, Electric Supply Company, Ltd., Vancouver, B. C.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, James Redpath, 505 Rialto Bldg., San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, J. E. Kearns, General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis. Next meeting, Hotel Wisconsin, Milwaukee, Jan. 15 to 17.

ELECTRICAL DEALERS AND CONTRACTORS' ASSOCIATION OF ONTARIO. Secretary, E. A. Drury, 45 Murray St., Toronto, Can.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General Secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, Gadsden Russell, Atlanta, Ga.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. L. Blumenthal, 179 West Washington St., Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, G. H. Stickney, 4th and Sussex Sts., Harrison, N. J.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 111 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General Secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

JOVIAN ORDER. Jupiter (president), Henry L. Doherty, New York City; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary, E. A. Wright, Manhattan, Kan. Annual meeting, Topeka, Kan., Dec. 7-8.

KENTUCKY ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Herbert E. Ottenheimer, Louisville, Ky.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St., New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N. Minneapolis, Minn.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, F. R. Porter, St. Cloud, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, R. H. Smith, Jackson, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Bldg., Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION. N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M. Annual convention, Albuquerque, N. M., Feb. 12-14.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary, H. M. Stine, 211 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, David S. Brown, 206 W. 86th St., New York.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC LIGHT ASSOCIATION. Secretary, A. H. Savage, Dakota Light & Power Co., Flandreau, S. D.

SOUTHEASTERN SECTION N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Eugene Ashe, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

Record of Electrical Patents

Notes on United States Patents issued on Nov. 11, 1916.

1,205,156. Electrical Dental Engine; William E. Butler, Perry, Iowa. App. filed May 22, 1912. Electric motor for same.

1,205,167. Ignition System; Simon Deutsch, Detroit, Mich. App. filed March 29, 1916. Single induction coil or other high-tension source may be utilized for the ignition of the gases.

1,205,181. Regulating Electrical Systems; George R. Fessenden, Jr., New York City. App. filed Dec. 21, 1911. Used for charging a storage battery.

1,205,194. Igniting Mechanism for Internal-Combustion Engines; William Grunow, Jr., New York City. App. filed Oct. 28, 1915. Comprises a make and break igniter having two electrodes.

1,205,196. Lighting Fixtures; Edwin F. Guth, St. Louis, Mo. App. filed Aug. 18, 1915. Minimum number of parts.

1,205,197. Commutator; Hugo Haage, Bernau, near Berlin, Germany. App. filed July 13, 1915. For large continuous current dynamos.

1,205,207. Process and Apparatus for Recovering Metals from Liquids; Charles E. Holland, New York City. App. filed Dec. 10, 1913. To recover or reclaim from the streams in the vicinity of mines and mills.

1,205,244. Signal Apparatus; Charles E. Mitchell, Stockton, Cal. App. filed Feb. 13, 1915. Direction-indicating signal for motor vehicles.

1,205,248. Printing-Telegraph Apparatus; Carl Eric Nelson, Wilkinsburg, Pa. App. filed April 18, 1914. Connections for the selecting magnets of a home recording receiver.

1,205,259. Automatic Circuit Closer; Howard Plymale, West Huntington, W. Va. App. filed Aug. 2, 1915. Float-controlled circuit closer.

1,205,266. Electrical Switch-Throwing Mechanism; James A. Ross, Altoona, Pa. App. filed March 13, 1915. Electrically operated by the car operator within the moving car upon its approach to the switch.

1,205,271. Safety Chest; John H. Safford, Brooklyn, N. Y. App. filed Nov. 11, 1914. Enables the chest to stand on any ordinary support without actuation of the mechanism.

1,205,281. Compensation Device for Line Wires; Arvid C. Sorensen, Webster, N. D. App. filed April 1, 1916. Compensating the length of telephone and telegraph wires in extreme weather conditions.

1,205,319. Signal Box; Clarence E. Beach and Lee J. Voorhees, Binghamton, N. Y. App. filed Feb. 23, 1915. A manual starting or operating handle.

1,205,343. Apparatus for Testing Dry Cells; Joseph H. Goodwin and Frank A. Adamski, Freemont, Ohio. App. filed May 12, 1913. Mechanism for testing dry cells.

1,205,348. Circuit Maker and Breaker; William A. Hoeneman, Brooklyn, N. Y. App. filed Nov. 23, 1915. Improvement in safety devices for elevators.

1,205,350. Single-Wire Trolley; George A. Jillson and Henry G. Andrews, Sacramento, Cal. App. filed June 22, 1916. For use on electric cars to permit the cars on a double-track road to employ the same trolley wire.

1,205,365. Method and Apparatus for Wireless Telephony; John P. McCarty, Oakland, and Kendall Douglas, San Francisco, Cal. App. filed March 6, 1912. For spark telephony.

1,205,374. Ground Connector; Israel Marcus, Winthrop, Mass. App. filed Jan. 24, 1916. Adjustable.

1,205,377. Electrode for Arc Lamps; William Roy Mott, Lakewood, Ohio. App. filed Nov. 8, 1911. Will impart a desired color to the arc stream and insure a non-flickering, steady light.

1,205,380. Combination Electric Lamp and Stove; Norman G. Nicoll Newark, N. J. App. filed April 5, 1916. Apparatus which may be used for illuminating purposes or for heating or cooking.

1,205,392. Electric Battery; Lloyd R. Rhoades, Freemont, Ohio. App. filed Dec. 18, 1915. New and useful improvement.

1,205,434. Electric-Circuit Controller; Roy Connell, Westfield, N. J. App. filed Dec. 15, 1911. Provide an inexpensive and thoroughly reliable instrument.

1,205,460. Receiving Apparatus for Electric Telegraphs and Electric Selective Systems; William Joseph Lyons, Dublin, Ireland. App. filed May 5, 1913. Calling or other device can be automatically brought into action at any particular station or place after the complete reception.

1,205,467. Electric-Circuit Controller; Samuel Mazur, Buffalo, N. Y. App. filed Feb. 14, 1916. Associated with clocks.

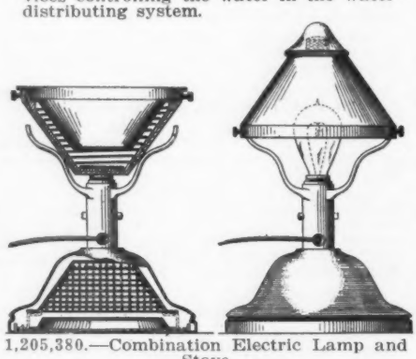
1,205,469. Apparatus for Space Transmission of Energy; Frederick Hoyer, Millener, Omaha, Neb. App. filed April 10, 1911. Certain new and useful improvements.

1,205,499. Telephone Exchange System; Joseph L. Wright, Washington, D. C. App. filed Feb. 8, 1913. Improved means in recording or indicating calls between exchanges or switching stations.

1,205,511. Method of and Apparatus for Welding; Harry E. Butcher, Cleveland, Ohio. App. filed Dec. 22, 1913. New and useful improvement in methods.

1,205,512. Method of and Apparatus for Making Tubing; Harry E. Butcher, Cleveland, Ohio. App. filed April 1 1914. Provide a simple and convenient method for inserting the brazed material between the edges of the preliminary formed tube.

1,205,517. Fire Protection System; John W. Cox, Erie, Pa. App. filed May 9, 1913. Controlled at points remote from the devices controlling the water in the water-distributing system.



1,205,380.—Combination Electric Lamp and Stove

1,205,518. Telephone Exchange System; Edward B. Craft, Hackensack, N. J. App. filed July 23, 1915. Improvements in telephone systems of the type in which the calls are brought in to the opeartor through the medium of switches.

1,205,520 Selector Switch; Henry F. Dobbin, New York City. App. filed June 10, 1916. Automatic switches for use in telephone systems.

1,205,523. Telephone Exchange System; Bert G. Dunham, Hawthorne, N. J. App. filed May 22, 1916. Improved means for giving a special audible signal to the operator in all cases of such "revertive" calls.

1,205,530. Method of and Means for Translating Sounds; Ray E. Hall, Portland, Ore. App. filed April 16, 1914. Provide a method of and apparatus whereby the sound waves set up by the diaphragm of a wireless receiver are automatically translated into mechanical movements to and fro.

1,205,536. Automatic Switch; George H. Heydt, New York City. App. filed June 10, 1916. Rotatable brush is made to engage contacts arranged in a line in the plane of rotation of said brush.

1,205,538. Telephone System; Edward E. Hinrichsen, East Orange, N. J. App. filed Oct. 8, 1915. Establishing connections between subscribers, where three or more central and local offices are involved.

1,205,549. Electric Switch; Henry Kruesheld, Irvington, N. J. App. filed Nov. 11, 1915. For lighting and extinguishing lamps.

1,205,558. Test Bench; Edward A. Halblieb, Rochester, N. Y. App. filed June 19, 1915. Testing dynamo-electric machines designed for use as both motors and generators.

1,205,569. Electrically-Heated Chocolate Table; Henry W. Schwimmer, Indianapolis, Ind. App. filed Nov. 7, 1914. Provide an electric heating device for maintaining the chocolate at uniform temperature.

1,205,570. Method of and Apparatus for Electric Welding; Frank L. Sessions, Lakewood, Ohio. App. filed May 7, 1913. Blast so located and directed as to supplement the action of the heating current.

1,205,571. Electric Heater (electrolytic type); George Sharpnack and Thomas J. Nash, Lincoln, Neb. App. filed March 27, 1916. Maintain the temperature of circulating water in water jackets above the freezing point.

1,205,589. Sectional Outlet Box for Electric Conduits or Wires; Lester J. Young, Oswego, Ill. App. filed June 7, 1915. Comprises one or more sections or units that are adapted to interlock with each other.

1,205,617. Telephone Exchange System; Charles L. Goodrum, New York City. App. filed May 22, 1916. Average time interval between the removal of the receiver by the calling party and the connection with his line terminals by a finder is reduced.

1,205,618. Speech-Transmitting Mechanism; Elwood Grissinger, Buffalo, N. Y. App. filed Sept. 17, 1914. The resilience of a torsional pivot is applied through a lever element.

1,205,620. Charging Storage Batteries; Varian M. Harris, Chicago, Ill. App. filed Aug. 24, 1912. Means for compensating for the electrolytic lag when a pulsating undirectional current is used for charging the battery.

1,205,624. Switch; Ellsworth A. Hawthorne, Bridgeport, Conn. App. filed July 31, 1913. Combined battery with casing and switch.

1,205,628. Portable Electric Light; Gustave Frederick Hitzelberger, London, England. App. filed March 9, 1914. Electric candle.

1,205,629. Circuit Controller for Portable Electric Lights; Gustave Frederick Hitzelberger, London, England. App. filed Jan. 6, 1915. Improved construction of circuit controller.

1,205,633. Portable Electric Light; Conrad Hubert, New York City. App. filed March 6, 1915. General appearance of oil-burning lantern.

1,205,645. Electric-Battery Lamp; James W. Lawhead. Wilmington Ohio. App. filed Dec. 7, 1914. Improvement of hand searchlights.

1,205,646. Electromagnetic Bell; Lewis A. Littler, Shelby, Ohio. App. filed April 28, 1916. Requires a minimum of current consumption for its operation.

1,205,665. Heating and Cooking Apparatus; Walter Ward Roberts, Seattle, Wash. App. filed Dec. 22, 1915. Fireless cooking principle.

1,205,677. Inking Mechanism for Bulletin-Printing Machines; Karl A. A. Staahlgren, New York City. App. filed Nov. 20, 1915. For telegraph printers.

1,205,682. Spark Intensifier; Robert M. Sutherlin, Kansas City, Mo. App. filed Oct. 21, 1915. For internal combustion engines.

1,205,683. Attachment Plug and Receptacle; George B. Thomas, Bridgeport, Conn. App. filed Oct. 21, 1915. Improvements.

1,205,700. Selecting Device for Automatic or Semi-Automatic Telephone Systems; Gotthile Ansgarius Betulander, Sodertorns Villastad, and Nils Gunnar Palmgren, Stockholm, Sweden. App. filed June 26, 1914. To simplify selecting devices.

1,205,725. Inclosed Arc Lamp; Karl Ferber, Berlin, and Wilhelm Wissmann, Charlottenburg, Germany. App. filed April 4, 1913. Comprising smoke arresters.

1,205,731. Relay; Hans Gerdien, Berlin-Schmargendorf, Germany. App. filed Nov. 25, 1914. Having an oscillating system working on the contact principle.

1,205,737. Incandescent Electric Lamp; Francis Harrison and Francis Leslie Harrison, Prestwick, Scotland. App. filed Oct. 24, 1913. Method of attachment of the filaments in place.

1,205,750. Motor Arc Lamp; Fritz Kiesler, Berlin-Charlottenburg, Germany. App. filed April 17, 1914. Ignition will be essentially facilitated in case scoria has been deposited on the points of the carbon pencils.

1,205,770. Ignition Dynamo; Charles Thomas Mason, Sumter, S. C. App. filed Nov. 21, 1912. Magneto is composed of several unit groups that may be readily separated from each other.